ELECTRICAL WEST

May 1954
25 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U.S.

Stockholders Come West.....156

Single Phase or Three Phase..... 66

West Meets in Three IES Regionals 79

Industrial Show a Success..... 85

The Throat You Cut May Be Your Own..... 63

Improve Regulation—Increase Revenue..... 69

Forecast Floods in North, Dry in South..... 72

Extra High Current Tests Now Possible..... 76

Sell the Risk Out of Credit 98

Weather, Appliances Feature Phoenix Show.....100

on the way:

More power for Central and Southern California!

WA
PAG

Redondo Steam Station No. 2

Initially to have one 156,000 kilowatt generating unit, the station is scheduled for completion in October, 1954, at an estimated cost of $25,000,000.

El Segundo Steam Station

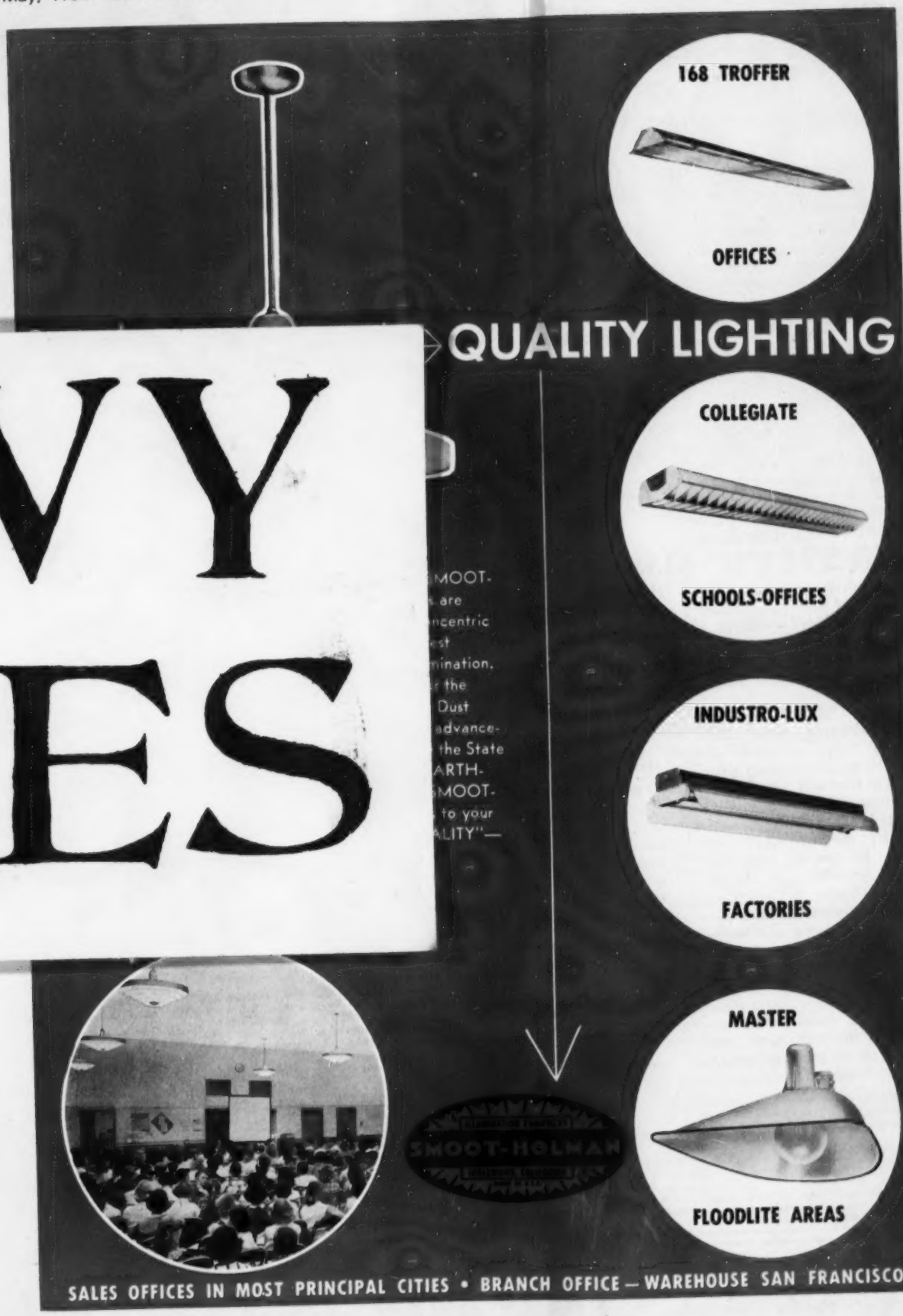
Scheduled to be "on the line" in July, 1955, with its initial 156,000 generating unit, this plant also is now under construction. Approximate cost will be $24,000,000.

Vermilion Valley Reservoir

A new 125,000 acre foot reservoir under construction in the High Sierra, Vermilion will be in operation in 1955. It is expected to add as much as 76,000 kilowatts to the dependable capacity of Edison's six Big Creek-San Joaquin River hydroelectric powerhouses in dry years.

Southern California Edison

SOUTHERN CALIFORNIA EDISON COMPANY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SMOOTH-HOLMAN
SALES OFFICES IN MOST PRINCIPAL CITIES • BRANCH OFFICE—WAREHOUSE SAN FRANCISCO

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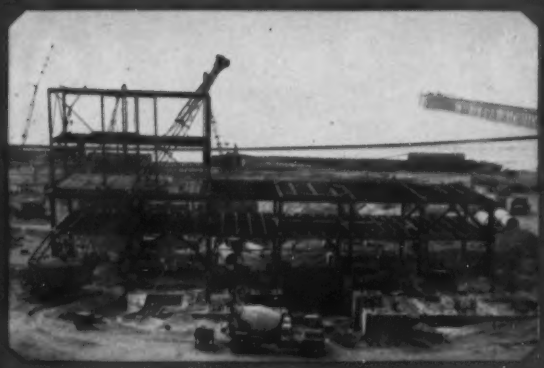

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SOUTHERN CALIFORNIA EDISON COMPANY

See better with→QUALITY LIGHTING

Vision is a source of knowledge. To increase learning ability, increase vision. SMOOT-HOLMAN "QUALITY" lighting fixtures are engineered for the classroom. Sturdy concentric rings of the CIRCL-LITE offer the greatest efficiency of low-brightness indirect illumination. A comfortable, better controlled light for the rigid requirements of classroom seeing. Dust free, contemporary designs are a major advancement of classroom beauty. Approved by the State of California Division of Architects as EARTHQUAKE PROOF. You can apply other SMOOT-HOLMAN "QUALITY" lighting fixtures to your lighting needs. Specify and Install "QUALITY"—THERE IS A DIFFERENCE—

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MAY 1954

SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S.
The all-industry magazine of progress, established 1887, and incorporating the "Electrical Journal," "Journal of Electricity, Power and Gas" and "Journal of Electricity." Contents copyright. Sixty-sixth year of publication

VOL. 112 NO. 5

ELECTRICAL WEST

George C. Tenney, Editor
W. A. Cyr, Associate Editor — Walter C. Heston, Engineering Editor
Peggy Boyer, Associate Editor — John Coatz, Typography

Next Month

June is the occasion of Electrical West's "Convention-in-Print" issue. This year's "program" bristles with top-notch "speakers" on timely industry problems. We will hear, of course, from the presidents of the West's three associations. Each will discuss problems peculiar to his section.

The lid is off in all sections of the West on load building. Hence there is a reactivation of sales programs all along the line. One of the best examples is the program of Arizona Public Service. Don Willis will "speak" on that program.

Ralph Tudor, under-secretary of the Department of the Interior, will have a message on the new look of the Eisenhower administration's federal power policy.

Dean O'Brien, University of California, will have some very pertinent remarks on engineering education that will be of value to employers in the various branches of the industry.

L. E. Karrer, executive vice-president of Puget Sound Power & Light Co., places squarely in the engineer's lap the challenge for new methods to help management combat rising unit costs.

Edwin Fleischmann makes a contribution on house heating with an analysis of a recent study on that subject.

CONTENTS

The Throat You Cut May Be Your Own by A. H. Gudie.. 63

ENGINEERING

Single Phase or Three Phase by Don Willis..... 66
Improve Regulation—Increase Revenue by F. A. McCrackin and L. J. Flanigan..... 69
Forecast Floods in North, Dry in South, by Clyde E. Houston and Homer J. Stockwell..... 72
Extra High Current Tests Now Possible by F. H. Cole, E. K. Sadler and Royal W. Sorensen.. 76

LIGHTING AND WIRING

West Meets in Three IES Regionals..... 79
Industrial Show a Success..... 85
Extensions Modernize Seattle's Luminaires..... 86

SALES

Business Development Tours PCEA Area..... 94
Sell the Risk Out of Credit, by J. F. Gensley, Jr..... 98
Weather, Appliances Feature Phoenix Show.....100

ASSOCIATIONS

Joint Meeting for PCEA-PCGA.....106
Engineers Told to Watch Economics.....129

DEPARTMENTS

Bulletins	54	New Products	37
Contractors' News Letter	87	News	138
Editorials	92	PCEA	112
Electra's Husband	58	Sales Guide News Letter	101
Letters to the Editor	28	Advertising Index	158

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Dean L. Potter

"Milwaukee Avenue has become the 'bright spot' of South Milwaukee with the installation of L-M's Uni-Ballast mercury vapor street lighting system," writes Mayor Dean L. Potter. "We are happy to report substantial savings in both installation and operation, and complete satisfaction with the system."

This system was put into operation July 2, 1952. Numerous other cities have since adopted this L-M-developed system because of its efficiency and economy.

L-M "Uni-Ballast" Lighting System A Proved Success Since 1952

Uni-Ballast is the series street lighting system for directly connected mercury vapor lamps. It eliminates individual ballasts; saves up to $90 per pole in labor and materials. Proved successful by numerous installations since 1952.

by **STACY STANDLEY**
Manager Lighting Sales
Line Material Company

Since July, 1952, when the first L-M Uni-Ballast system was put into operation, there has been a steady growth in interest in this revolutionary improvement in street lighting. Not only have more and more cities and utilities installed the system, but a number who have installed one system have ordered additional systems.

The L-M Uni-Ballast system offers marked economies. It eliminates individual ballasts, because 25 or more 400-watt mercury vapor lamps are operated in series on one Arctroller, L-M's static type regulator. These lamps would require a 25-kw regulator on a conventional series system.

The 25 lamps require only a single control station. Construction is simplified and more economical.

The Uni-Ballast system gives excellent cold-weather starting, because sufficient voltage is available to strike the lamp arcs. The maximum output voltage is limited by the saturation characteristics of the output transformer in the actual Arctroller circuit. When the Arctroller is connected to a mercury vapor lamp load, the voltage rises only to the value at which the lamp arcs strike. The Arctroller regulates faster than a moving coil regulator; surges are reduced to a minimum.

The system includes a voltage-sensitive time-delay relay, which prevents re-energization after outage until the lamps have cooled to the re-striking point. This protects lamp electrodes from unnecessary deterioration, minimizes bulb blackening, and assures greater lamp efficiency and maintains more uniform light levels. No half load starters required.

Power factor of the Arctroller is 94% to 100% between ½ and full load operation. This high power factor, and elimination of individual ballasts, saves about 12% in energy used.

*"Uni-Ballast" and "Arctroller" are trademarks of Line Material Company.

Some Uni-Ballast Systems Now In Operation Or Being Installed

Collinsville, Ala.
Lodi, Calif.
Emporia, Kan.
Oxford, Kan.
Boonville, Mo.
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Ripley, Tenn.
Rockwood, Tenn.
Houston, Texas
Lockhart, Texas
South Milwaukee, Wis.
Sun Prairie, Wis.
Thermopolis, Wyo.

Get the Whole Story on This L-M-Developed System

For complete information on the L-M Uni-Ballast system, ask the L-M Field Engineer to discuss it with you; or write Street Lighting Division, Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).

173

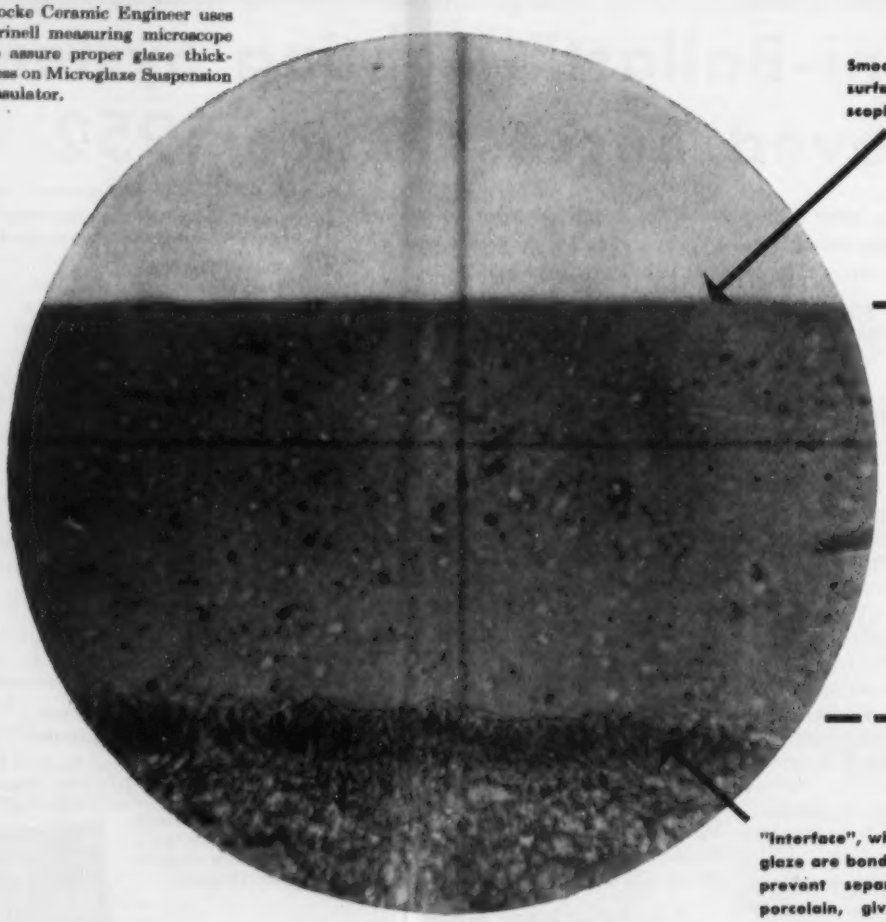
LINE MATERIAL *Street Lighting*

Locke reports new facts about GLAZE THICKNESS and

Research into their relationship leads Locke to develop . . .

Locke Ceramic Engineer uses Brinell measuring microscope to assure proper glaze thickness on Microglaze Suspension Insulator.

Photomicrograph of cross section near surface of Microglaze Suspension Insulator



Smooth, self-cleaning glaze surface results from microscopic glaze thickness control.

Thickness of glaze, measured between surface and junction with porcelain body is controlled by Locke to achieve peak strength.

"Interface", where porcelain body and glaze are bonded. Interlocking crystals prevent separation of glaze from porcelain, give added strength to Microglaze Insulators.

INSULATOR STRENGTH

NEW MICROGLAZE SUSPENSION INSULATORS

An insulator's ability to withstand mechanical impact varies with thickness of the compression glaze on its surface. Too much glaze . . . or too little . . . will prevent full development of insulator strength.

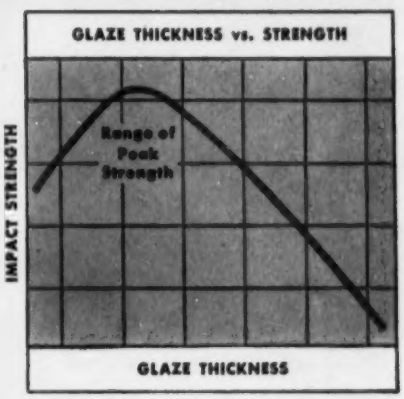
However, laboratory tests show that porcelain with a smooth coat of compression glaze, held within a microscopically narrow range of thickness, will be as much as 40% stronger than improperly glazed porcelain.

Locke has been quick to bring this discovery out of the lab and onto the production line for the benefit of all insulator users.

The result is the new MICROGLAZE Suspension Insulator.

Microscopic control of glaze thickness is now applied to these mass-produced suspension insulators, resulting in uniform peak strength, assuring you a new kind of protection . . . and longer, trouble-free insulator service life.

Next time specify MICROGLAZE Suspension Insulators . . . your best insurance yet against the hazards of mechanical impact.



Research in Locke laboratories proves definite relationship between glaze thickness and both flexural and impact strength of the porcelain. Curve shows how impact strength increases with increasing glaze thickness, reaches peak, then drops sharply. On Microglaze Insulators, glaze thickness is maintained within the narrow range which gives *peak* strength.

Accurate glaze thickness control is accomplished by use of this precision glazing machine. As each insulator spins its way around the wheel, it is cleaned, moistened, glazed, exactly the same way as every other. This, combined with special control of many other factors assures uniform appearance, uniform top strength, uniform reliability.

Send today for new 8-page folder titled "The Story of Microglaze Insulators"

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

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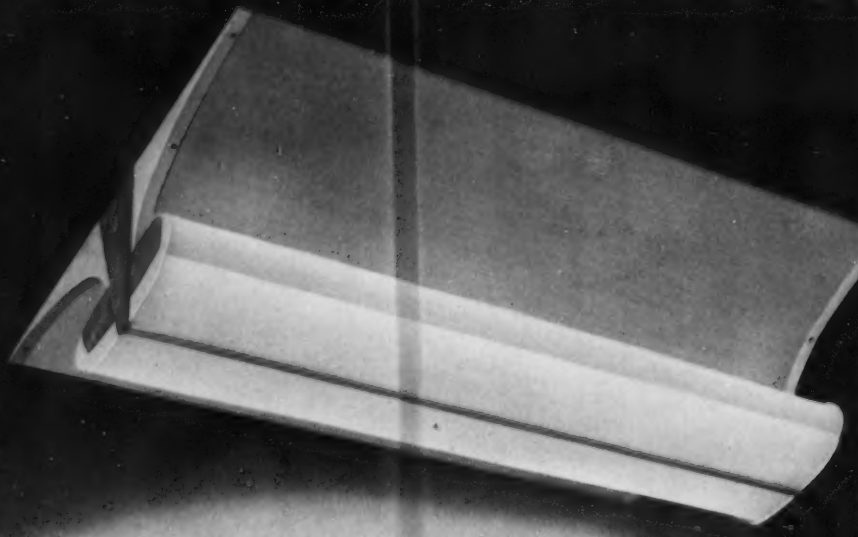
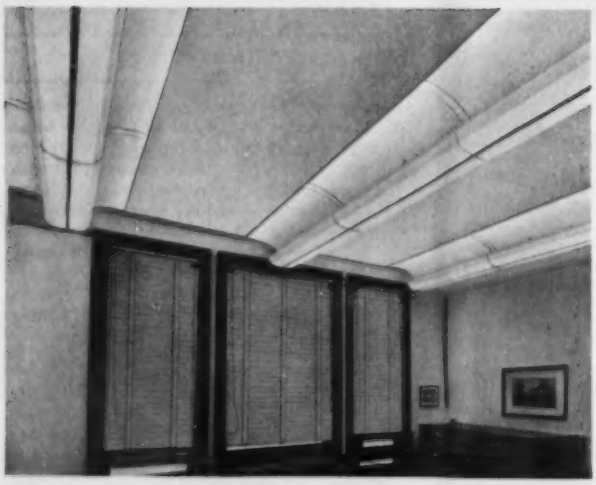
SYLVANIA ANNOUNCES—



Close-up of Sylvania Sono-Lume unit showing perforated metal wings backed with sound-deadening glass fiber batting. Fixtures may be also equipped with louvers instead of plastic shielding. Mounted singly or in continuous rows.

SONO-LUME*.....

the Fixture† which Controls Sight and Sound!



New fluorescent lighting fixture has built-in sound-conditioning system . . . easily installed!

Now Sylvania introduces SONO-LUME . . . a new concept of sight and sound control!

Basically, Sono-Lume is an attractive fluorescent fixture incorporating principles worked out by Sylvania engineers.

The perforated wings on each side of Sono-Lume fixtures are backed with glass fiber batting. This element has the excellent noise reduction coefficient of 0.85. Thus the fixture serves a double purpose: (1) It provides high levels of clear, soft, all-over illumination for comfortable seeing. (2) It holds unnecessary noise to low levels for comfortable hearing.

Saves modernization costs!

Sylvania Sono-Lume fixtures can be readily installed in any office, conference or consultation room. In instances where sound-proofing and better lighting are separate projects, this new combination fixture keeps costs well within modest budgets. A note on your letter-head will bring you detailed information. Simply address Dept. 4X-2605, at Sylvania.

*Sylvania Trade Mark
†Patent Pending

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.
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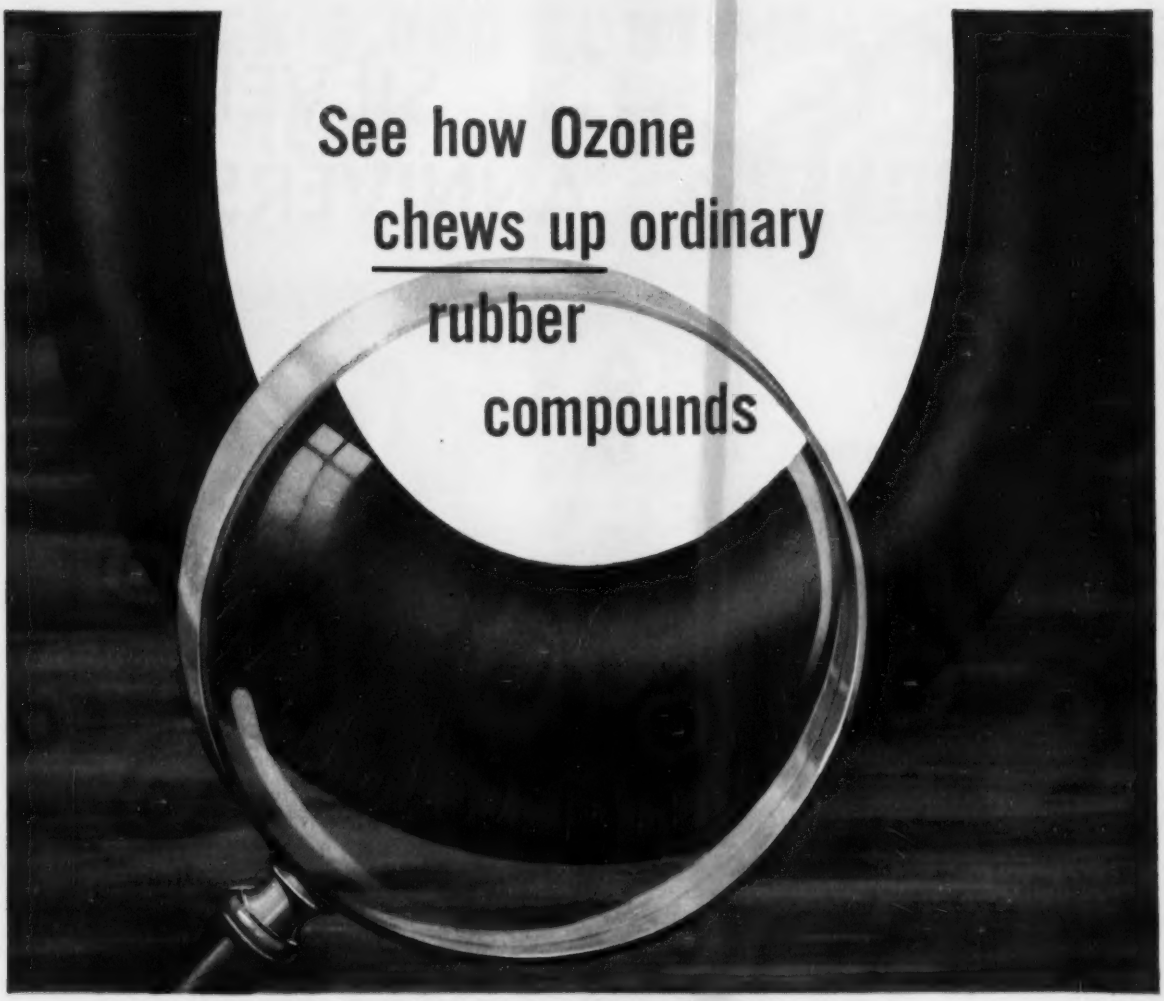
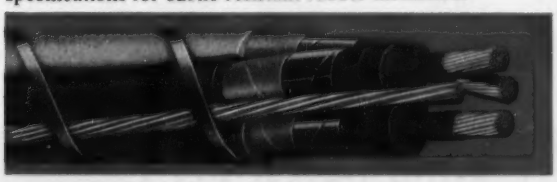
LIGHTING · RADIO · ELECTRONICS · TELEVISION



but not U. S. Grizzly Uskorona-insulated power cables

Here's an illustration showing how ozone can chew up a sturdy, rugged cable. This can never happen with United States Rubber Company's famous Grizzly® power cables, insulated with Uskorona® compound which prevents electrical failure caused by ozone (Uskorona-1 oil base compound and Uskorona-2 butyl base compound). Uskorona meets (and in many ways exceeds) the applicable IPCEA specifications for ozone-resistant rubber insulation.



U.S. Grizzly Uskorona-insulated Power Cable, 15,000 volts, Type RR, 3 conductor, shielded, Neoprene jacket

U.S. Grizzly ozone-resistant power cables are typical of the wires and cables "U.S." develops to meet the ever-increasing rate of expansion of electrical generation and construction. "U.S." is always ready with new products to meet new demands and is always developing, as a matter of policy, wires and cables that are more economical because they are more serviceable.

Send for free illustrated book giving full information about U.S. Electrical Wires and Cables for the Electric Utility Industry.

US RUBBER

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE & CABLE DEPARTMENT, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

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SILVER ANNIVERSARY

This illustration shows the George A. Posey Tube which was opened to the public in October of 1928. At that time 17 GARDNER dry type transformers, 2400 volts to 120 volts were installed and have been in continuous operation since. Housed in cubicles, one of which is shown on the left below the walkway, these GARDNER transformers have delivered dependable service going into this, their 25th year of operation. The Posey Tube as it is familiarly known, links the island of Alameda and the city of Oakland.

For special applications, GARDNER supplies a complete line of dry type transformers up to 500 KVA. Shown here are some 25 KVA, single phase, dry type units, also a 112½ KVA, 3 phase dry type transformer with its case removed and standing behind it.

★

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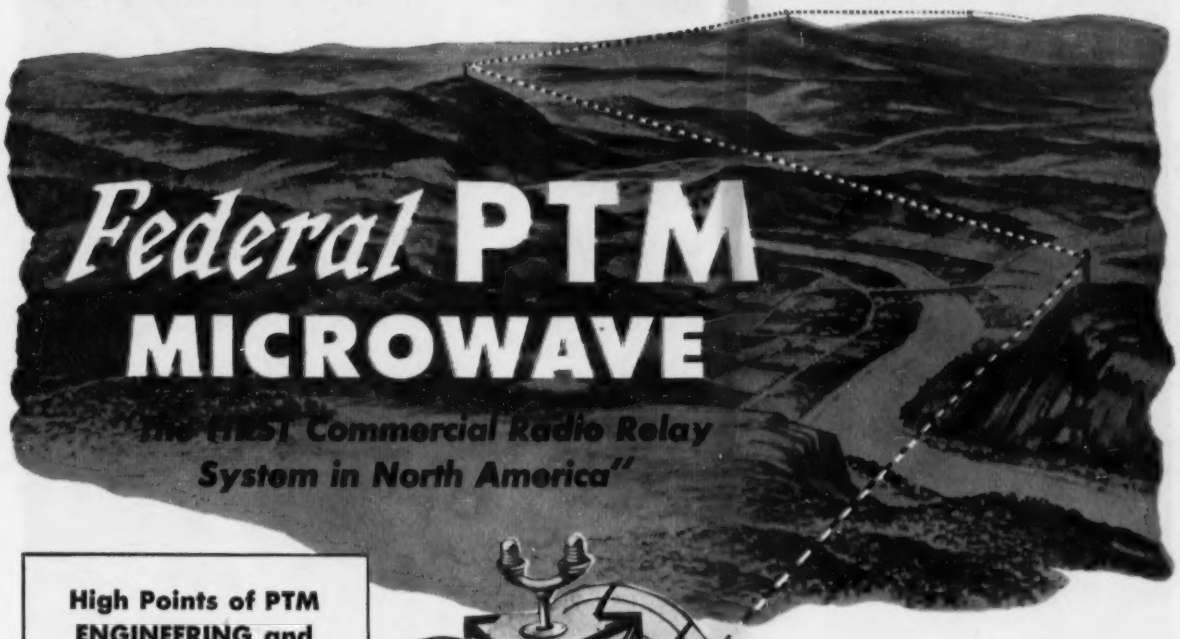

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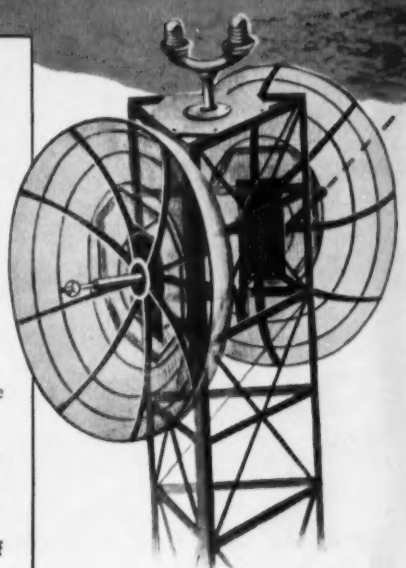

MICROWAVE MOVIES:

Be sure to see Federal's 16 mm. sound-and-color motion pictures:

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IT'S A FACT...

IT&T scientists conducted the *first* successful demonstration of voice communication via *microwave*, March 31, 1931, across the English Channel.

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Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.

Youngstown

QUALITY YOUNGSTOWN SERVICE

●Any electrician recognizes Youngstown rigid steel conduit the moment he starts to bend it. He'll tell you that Buckeye is easier and faster to bend than any other kind. This means you save hours of labor with Youngstown Buckeye Conduit.

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Remember that Red Hot 1949 Briegel Combination Indenter and Fitting Deal? It broke all records then so here we go again!

For three months only, August, September and October, a Special Package Offer of 200-½" B. M. Couplings and 400-½" B. M. Connectors. Free of extra cost in this package will be 1 No. 606 Briegel ½" Indenter!

Stock up today with this Deal that sold out the last time it was offered.

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BRIEGEL METHOD TOOL CO.

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ROCKBESTOS A.V.C.® — N.E.C. TYPE AVA

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Tel: Sweetwood 8-2955
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NEW HAVEN 4, CONNECTICUT

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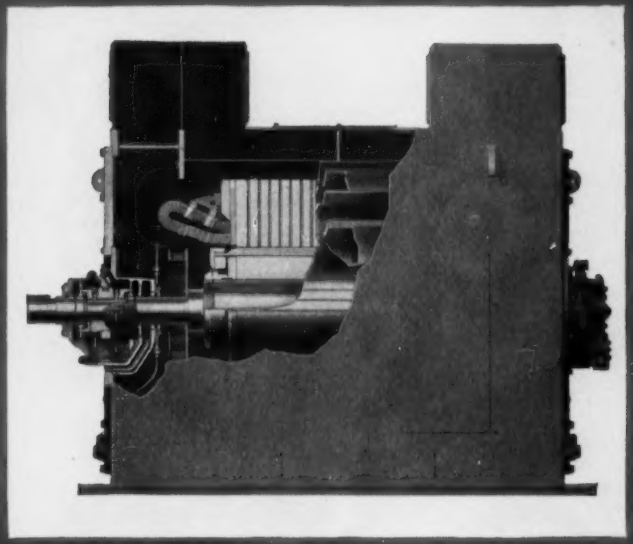
INSIDE AND OUT



ALLIS-CHALMERS Boiler-Feed Pump MOTORS

New features improve 2-pole motors long known for reliability and low maintenance.

New ventilating arrangement features top air intake and discharge *plus* spiral stator core ventilation. Top intakes (available with filters) keep motor clean and make motor room cleaning easy; top discharge adds to personnel comfort. Spiral ventilation — used in turbine generators — assures even internal cooling . . . combines with centrifugal fans and baffled air passages to reduce noise.

Improved bearing design simplifies maintenance, prevents oil leakage. Capsule-type housings — proved in use on other designs — permit inspection of windings without exposing bearings. Oil leakage is prevented by a combination of features, including orifice-metered oil flow, weirs to maintain correct oil level, labyrinth seals, breathers, and annular pressure chambers with atmospheric relief.

Clean-cut appearance is gained by providing internal space for stator and auxiliary leads, etc.

Features that helped build the Allis-Chalmers 2-pole motor reputation for reliability are retained in the new design. These include proven stator coil design, ample stator coil end bracing, thermally and mechanically stable cage assembly, separate balancing rings, and oxygen-free dew-drop cage bars.

This design available in ratings 900 hp and larger. Ask your A-C representative for Bulletin 05R8123. Allis-Chalmers, Milwaukee 1, Wisconsin. A-4350

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

APPARATUS SERVICE SHOPS

Atlanta, Ga.
Baltimore 30, Md.
Boston, Mass.
Buffalo 11, N. Y.
Charleston 28, W. Va.
Charlotte, N. C.
Chicago 80, Ill.
Cincinnati 2, Ohio
Cleveland 4, Ohio
Columbus 15, Ohio
Dallas 9, Texas
Denver 5, Colo.
Detroit 2, Mich.
Houston 20, Texas
Johnstown, Pa.
Kansas City 8, Mo.
Los Angeles 1, Cal.
Milwaukee 3, Wis.
Minneapolis 12, Minn.
New York 14, N. Y.
Philadelphia 23, Pa.
Pittsburgh 6, Pa.
Portland 18, Ore.
Richmond 24, Va.
St. Louis 10, Mo.
Salt Lake City 4, Utah
San Francisco 3, Cal.
Seattle 4, Wash.
Toledo 4, Ohio
York, Pa.
Youngstown 5, Ohio

DISTRIBUTION TRANSFORMERS

different from others because.....

...Nationwide service facilities *keep your transformers "on the line"... provide day and night emergency or quick reconditioning service*

Whether a sudden storm brings chaos to your system, or repair work piles up . . . here's the simple, easy way to get your inactive transformers of any make back "on the line" . . . faster.

NATIONWIDE SERVICE FACILITIES, through General Electric service shops, are as near as your telephone (see list of cities at left). Burned out core-and-coils can be replaced, or your 1½- and 3-kva transformers can be up-rated to 3 or 5 kva, or in some cases 7½ or 10 kva. Special equipment, genuine factory parts, and trained personnel assure prompt service and top performance.

REMEMBER... all transformers are not alike . . . compare the General Electric plus features in the chart below and see for yourself.

For more information on distribution transformers, either unit-type or conventional, contact your nearest G-E sales office, agent or distributor, or write to General Electric Company, Section 431-10, Schenectady 5, New York.

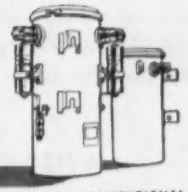
You can put your confidence in—

GENERAL ELECTRIC

ALL TRANSFORMERS ARE NOT ALIKE

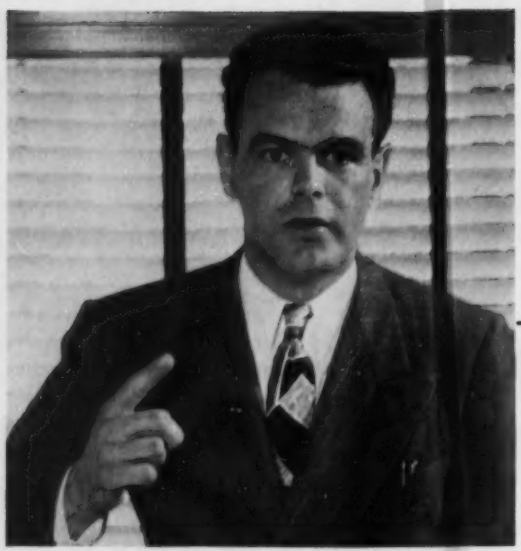
(make this simple comparison and see)

FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	YES	NO	NO	YES	NO	NO
Nitrile rubber gaskets at all tank openings	YES	NO	NO	NO	NO	NO
Strenicor pressure terminal clamps	YES	NO	NO	NO	NO	NO
One-piece cover band	YES	NO	NO	NO	NO	YES
Terminals designed for both copper and aluminum conductors	YES	NO	NO	NO	NO	NO
Gapped valve-type arresters	YES	NO	NO	NO	NO	NO
Nationwide company-operated service facilities	YES	YES	NO	NO	NO	YES



UNIT-TYPE CONVENTIONAL

"Take your choice G. E. makes both"



Let's be frank!

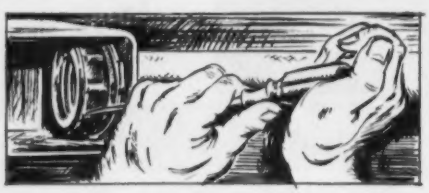
Are you getting what you expect from the Insulating Conduit Bushings you are using?

WILL THEY PASS THESE 4 IMPORTANT TESTS?

1. The one match test — Yes, the flame of just one match will set some thermoplastic bushings afire. Not so with Union bushings — there will be no flame after the match is out.

2. The heat test — Rough on those thermoplastic bushings which at 140° F. or higher lose their strength allowing as little as 3½ pounds pressure to pull them out of shape and thus cause serious hazards. But Union bushings can take heat to 450° F. and still remain rigid.

3. Free starting threads — Not round and pliable as in some thermoplastic bushings we have seen. Union bushing threads are sharp as die cut steel and spin easily into place, no matter how rough the conduit threads.



4. Convenient lugs — Make it possible to tighten or loosen Union bushings under the most cramped conditions using only a screwdriver as a tool. Compare this feature with any thermoplastic bushing that has no lugs and seizes so tightly it must be removed with a pipe wrench.

WHERE STRENGTH COUNTS

BE SURE YOU SEE **THE CANVAS**

UNION INSULATING CO., Parkersburg, West Virginia

Sangamo presents a NEW Singlephase Watthour Meter
– the Type J2 – the finest in Sangamo history

EXTENDED RANGE... The new J2 assures accurate measurement to 100 amperes, without sacrifice of performance at light loads. This provides sufficient reserve capacity to meet any contingency of future load growth.

EXTENDED STABILITY OF CALIBRATION... The J2 offers unusually long sustained accuracy of calibration because it has the lowest disk speed and highest torque of *any watthour meter* today.

EXTENDED MECHANICAL STABILITY... The J2 features improved corrosion-resistant finishes and materials to assure better and longer performance under even the most severe atmospheric conditions.

please turn page

also . . . the NEW Sangamo Type J2T Watthour Thermal

DEMAND METER

The J2T is also supplied with a 12 KW scale for power companies who measure demands on smaller loads and who want indications above ¼ to ⅓ scale.

Write for complete information on these cost-cutting demand meters today.

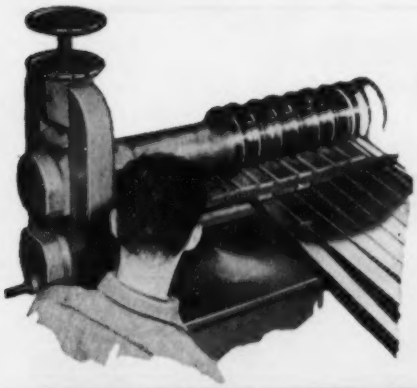
for *Greatly Reduced* Demand Measurement Costs

The Sangamo J2T watthour thermal demand meter takes full advantage of the extended range of the new J2 meter by extending the scale of this 15 ampere meter to 24 KW, at the same low price as its predecessor, the Sangamo JT. Power companies whose practice calls for measurement of demands in excess of 10 KW can use the scale of the 15 ampere J2T to cover loads which previously have required 50 ampere meters. Measurement costs are thus substantially lowered for the largest group on which demands may be measured.

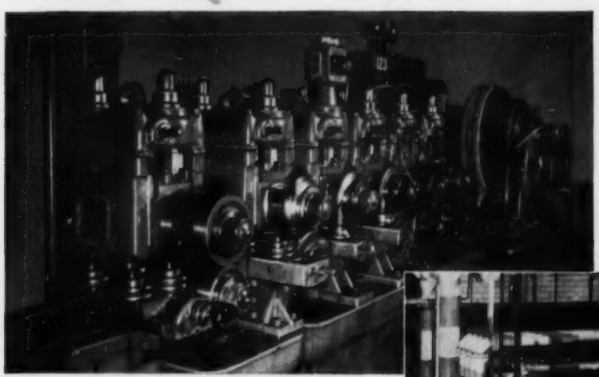
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

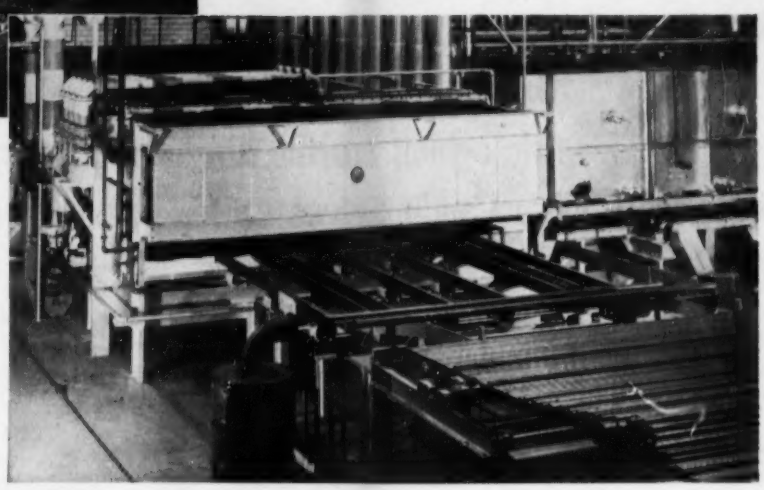
JM54-2



How Rome Cable Corp. makes rigid conduit from USS Hot Rolled Sheets



Making rigid conduit in sizes ranging from ½" on up to 2", strips of hot rolled steel are fed through a series of forming rolls on this tube mill (left). The seam is closed by electric resistance welding. Because of Rome Cable Corporation's unique process for producing rigid conduit, they can use hot rolled sheet steel and thereby achieve remarkably uniform inside diameter measurements and weight.



Hot-dip galvanizing is done by the Sendzimir Process (right). Under atmospheric control, all dirt, oil, etc., is burned off in the flame preheater, which also produces a uniform blue oxide on the pipe. In the reducing furnace the pipe is annealed and the hydrogen atmosphere reduces the blue oxide to a smooth, stainless surface. The pipe is then fed directly into the molten zinc bath (no pickling or fluxing is required) and, after emergence, excess molten zinc is removed by an air and superheated steam wipe.

Final inspection takes place after the product has been threaded and lacquered. Electrical metallic tubing, another Rome Cable Corp. item, is being inspected in this photo (left). The finished product is just one of the many examples of United States Steel at work. From start to finish... from open hearth to rolling mill . . . steel from USS is designed to do the best job for you. For additional information, or technical assistance, call your nearest Columbia-Geneva District Sales Office, or write Columbia-Geneva Steel Division, 1403 Russ Building, San Francisco 6, Calif.

Free!

United States Steel Corporation, EW-5
Columbia-Geneva Steel Division
1403 Russ Bldg., San Francisco 6, Calif.

Please send me your free wall chart showing weights, standard sizes, and gauges of Steel Sheets.

*Name*_____

*Address*_____

*City*_____ *State*_____

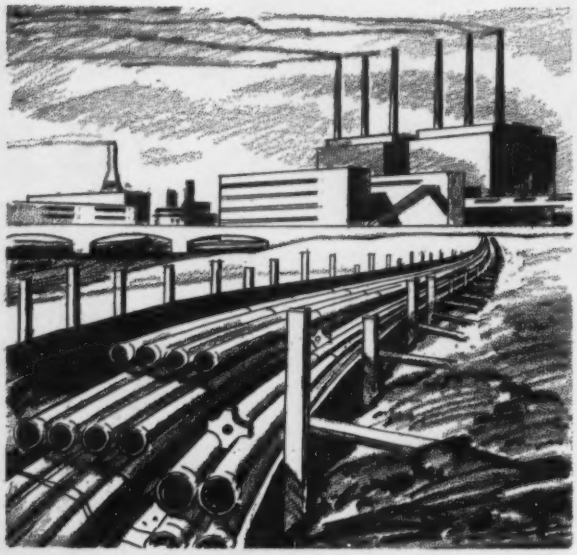
USS

USS Steel Sheets

United States Steel Corporation · Columbia-Geneva Steel Division

UNITED STATES STEEL

LIFE LINES



Oxygen lines are the life lines of every diver!

Electric cables are the life lines of every community!

Orangeburg Fibre Conduit gives cables complete underground protection!

ELECTRICAL CABLES...the *life lines* through which power flows into every community's homes, offices and plants...must have the fullest and the longest protection possible. And that is what they get in the underground ducts with Orangeburg Fibre Conduit.

This is a fact so well understood throughout the electrical industry that Orangeburg Fibre Conduit is a first choice of Public Utilities, Municipalities, Industries and Electrical Contractors everywhere.

The reasons for Orangeburg's High Quality! Tough, strong, resilient, non-metallic...Orangeburg Fibre Conduit does not crack or break. Its impermeable walls and tight joints bar out corrosive ground waters. Its smooth bore and low coefficient of friction protect cable sheaths from abrasion while *going in* and *after they are in* the duct. Orangeburg material resists acids, alkalies, salt, grease, oil. The net result: a *longer-lived* raceway for *longer* cable life.

Check these cost-saving advantages...Light weight ... long lengths ... readily assembled joints ... angle couplings, bends and other Orangeburg standard fittings ... these are some of the reasons why Orangeburg Fibre Conduit is so quick, easy and economical to install. Send to Dept. EL-54 for more facts.

ORANGEBURG MANUFACTURING CO., INC.
ORANGEBURG, NEW YORK
West Coast Plant, Newark, Calif.

ORANGEBURG FIBRE CONDUIT

STANDARD with concrete encasement **NOCRETE** without concrete encasement

GraybaR ELECTRIC COMPANY

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

BRANCHES AND STOCKS IN PRINCIPAL CITIES

GENERAL ELECTRIC SUPPLY COMPANY

A Division of General Electric Distributing Corporation

Formed from the Osage River by the Bagnell Dam, the Lake of the Ozarks provides storage for the Osage Power Plant equipped with eight Allis-Chalmers Francis-type turbines. This power plant carries part of the peak loads on the Union Electric Company of Missouri's integrated electrical system serving territory in Missouri, Illinois and Iowa.

First There Were Six

In 1930 Union Electric installed six Allis-Chalmers turbines at the Osage Power Plant. These six hydraulic turbines have required no unusual maintenance of any kind and their operation has been completely satisfactory.

When two new turbines were added in 1953, they were also supplied by Allis-Chalmers. Rated 33,500 hp, 90-ft head, 112½ rpm, all eight units are of the Francis runner, vertical, plate steel casing type. Having provided cabinet-type governors for the new units, A-C is now modernizing the valves for the original six governors.

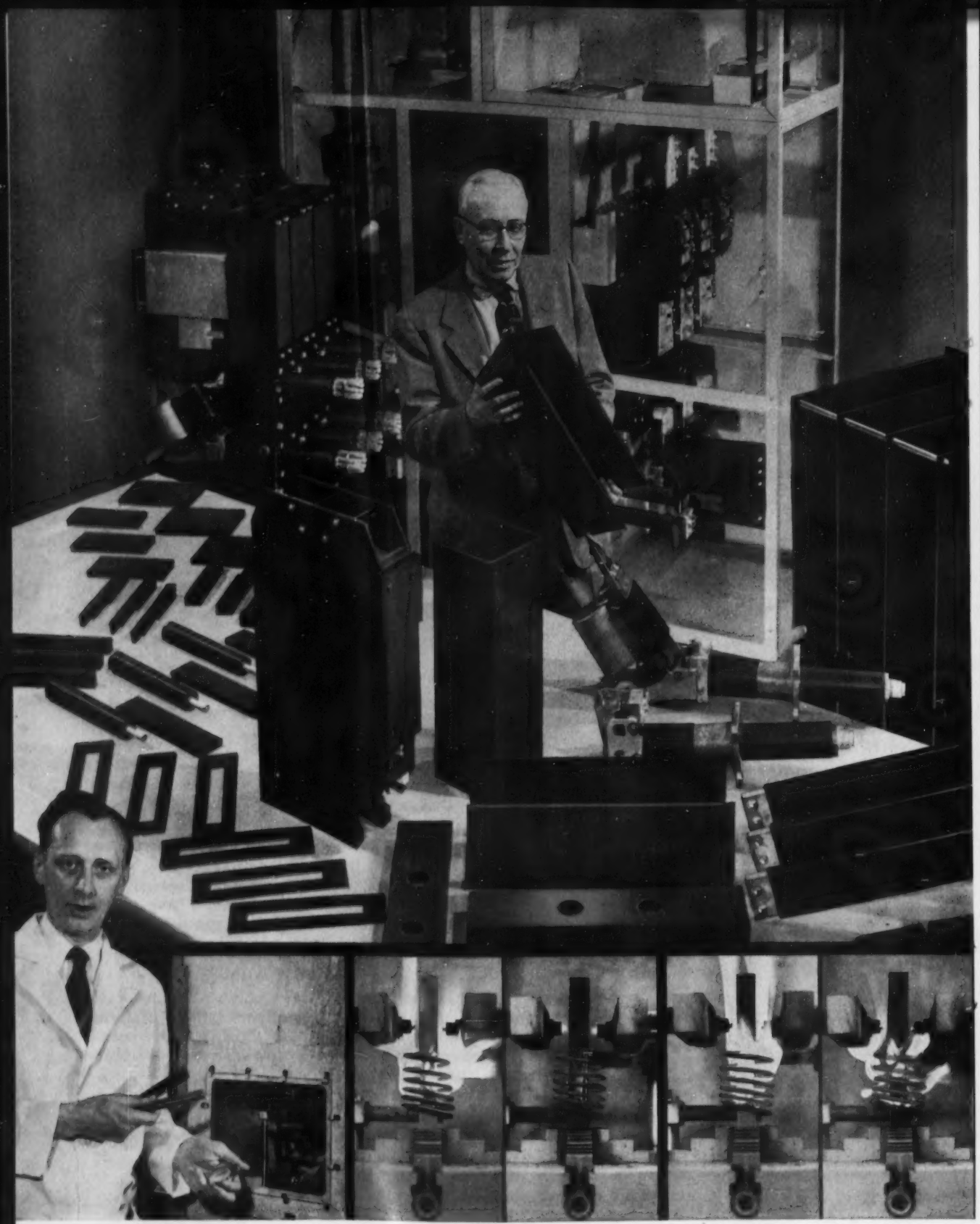
For half a century, Allis-Chalmers has been furnishing turbines, governors and auxiliaries for major installations of all types — propeller, Francis and impulse — in ratings up to 150,000 hp and 2500-ft heads. Write for Bulletins 01B7301 (turbines) and 05B7549 (generators). Allis-Chalmers, Milwaukee 1, Wisconsin, U. S. A.

A-4382

1904 50 1954
YEARS
Steam and Hydraulic
TURBINE
Manufacture

ALLIS-CHALMERS

A-C ALLIS-CHALMERS



Laboratory tests, supervised by Dr. Leonard E. Edelman, Westinghouse Research Engineer, prove conclusively the self-extinguishing and the greater fire-resistance characteristics of REDARTA.

Shortly after 55-ampere current was sent through the nichrome heater, the comparative insulation sample (left) had burst into flame. REDARTA (right), though charred from the extreme heat, had not yet begun to burn.

In nearly twice this length of time, REDARTA finally ignited. This unusually slow ignition time is the measure of the extra protection REDARTA gives you in Westinghouse metal-clad switchgear.

WESTINGHOUSE REDARTA INSULATION

New protection standard for metal-clad switchgear

REDARTA is the newest—and greatest—name in switchgear insulation. This entirely new Westinghouse insulation is superior in every way—*including flame-retarding ability*—to any fibrous insulation ever developed. And, because it is available in every shape and form, it is used *throughout* in Westinghouse metal-clad switchgear—not in just a few vital places—assuring you far greater over-all protection.

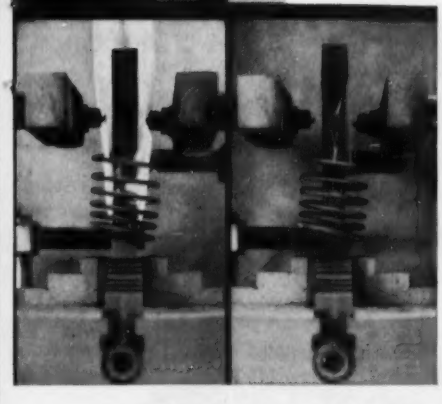
REDARTA's Greater Fire Resistance has been proved conclusively in laboratory tests (see below). When exposed to arcing caused by high ampere currents, REDARTA is slower to ignite—will stop burning quicker when arcing ceases. The fire extinguishing ingredients in the insulation release a gas that quickly retards the flames—prevents the fire from spreading to adjacent compartments.

REDARTA's All-Around Superiority was deliberate—the result of over 5 years of painstaking work by Westinghouse research engineers to improve *in every respect* the high-quality insulation then in use. How well they succeeded is shown in the comparative table below.

Superior protection is just one of many reasons why you should consider Westinghouse metal-clad switchgear. Others: Superior design and manufacturing, greater service continuity, greater safety and convenience, lower operation and maintenance costs, longer life. Get the complete story today from your Westinghouse representative or write Westinghouse Electric Corp., 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa. J-60863

YOU CAN BE **SURE**...IF IT'S

Westinghouse

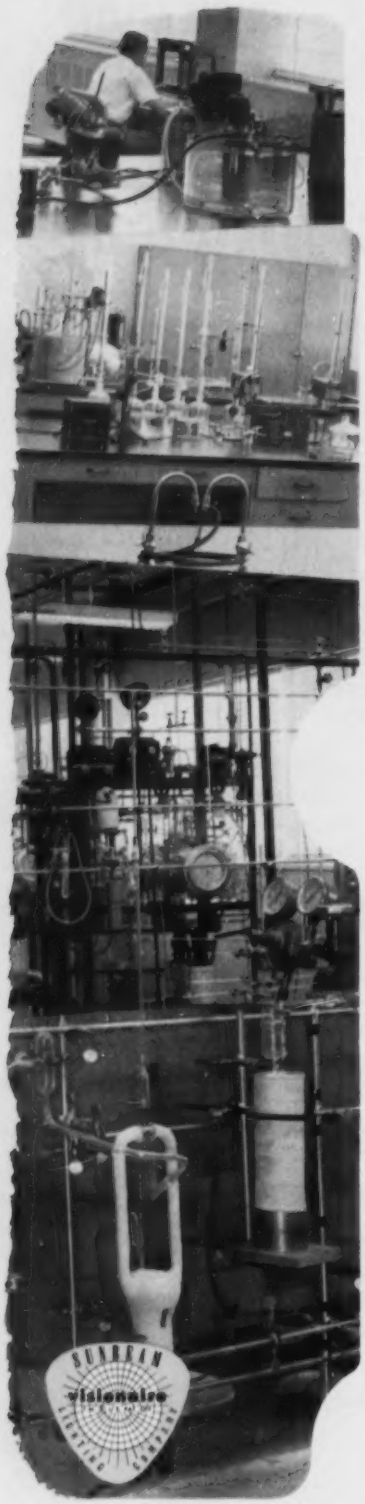


REDARTA stopped burning quickly after the current was turned off—the comparative sample burned until consumed. By extinguishing its own flame, REDARTA helps control fires.

CHARACTERISTICS	INSULATION A*	INSULATION B**	WESTINGHOUSE REDARTA
Tensile strength (psi)	12,000	10,000	22,800
Flexural strength (psi)	15,000	15,000	28,050
Compressive strength (psi)	36,000	32,000	51,320
Izod impact strength FW (foot lbs./inch width) EW	1.4 0.5	1.3 0.5	2.2 0.687
Moisture absorption (% increase in wt. 24 hr. room temp.)	0.40	1.5	0.93
Dielectric strength (short time volts/mil ⅛" thick)	700	500	840
Power factor 60-cycle (¼" thick)	7% max.	10% max.	4% max.

*Electrical grade laminate NEMA XXX.
**Development sample of electrical grade insulation treated with polyvinylchloride.

Comparative characteristics tell the story of REDARTA's all-around superiority. This table shows that in practically every characteristic vital to insulation performance, REDARTA is better than all other known insulations.

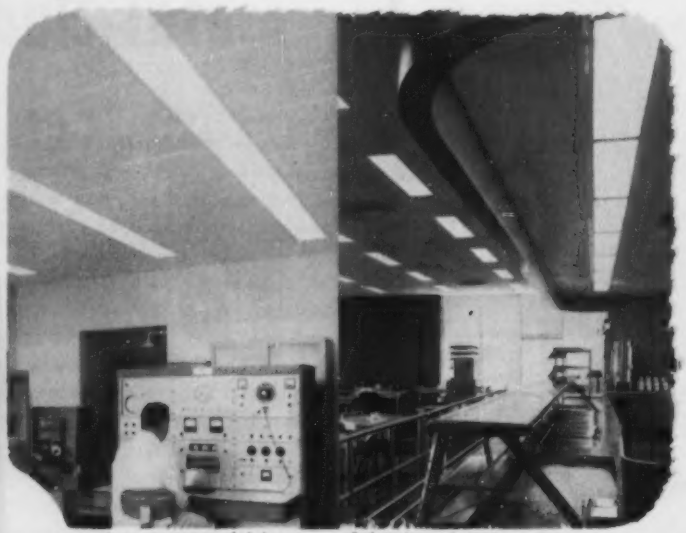


SUNBEAM

LIGHTING COMPANY

777 E. 14TH PL., LOS ANGELES 21, CALIF.

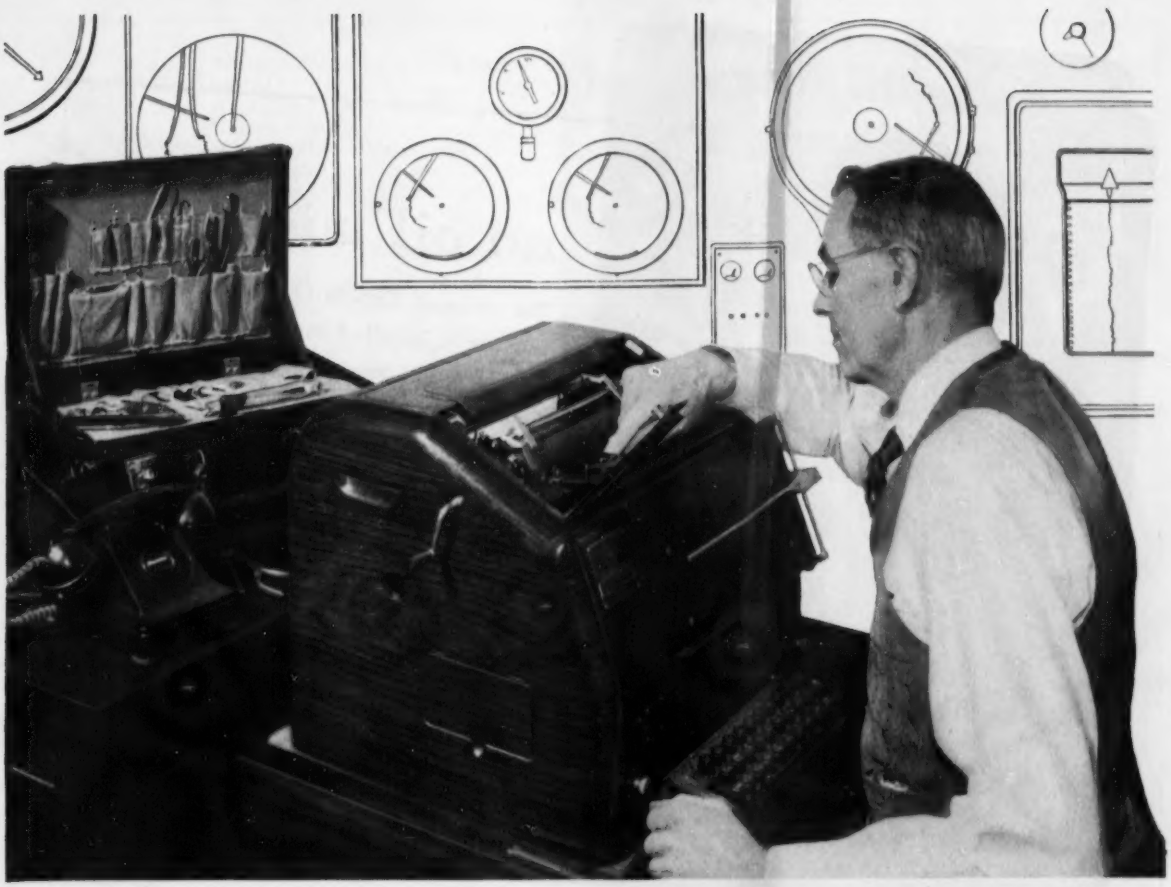
SUNBEAM THROWS LIGHT ON PETROLEUM RESEARCH



Mass spectrograph laboratory Cafeteria and kitchen

The Research Center of the Stanolind Oil and Gas Company, Tulsa, Okla. is one of the most modern and complete petroleum research laboratories in the world. Over 2450 Sunbeam fluorescent lighting fixtures of various types were installed in offices, laboratories and cafeteria. Most of the installation consists of Sunbeam's versatile, recessed troffers, #5600. T-Bar mounted at a height of 10 feet in acoustical tile ceilings, the continuous rows of louver shielded fixtures provide 55 footcandles of even illumination. Vapor-proof type units light the kitchen area in the cafeteria. For engineered lighting such as this, specify Sunbeam Lighting.

Chemical laboratory



When your communications are installed, Bell System service has just begun!

Installation of communication equipment is just the beginning of your Bell System service.

Behind every piece of equipment stands an army of trained technicians. Their skills are the end product of Bell System's 78 years of communications experience.

The work of these specialists is one reason for our remarkable record of reliability in the power field. From research through manufacturing, installation, operation and maintenance, Bell System people are on the job continually. They make sure that you get the finest communications service in the world.

Whether you need private-line telephone, mobile telephone or teletypewriter service, or channels for remote metering and supervisory control, get Bell System experts on *your* team.

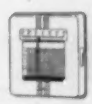
• • •

Your Bell Telephone Company will be glad to study your communications problems and needs without charge.

PRIVATE-LINE TELEPHONE

TELETYPEWRITER

MOBILE TELEPHONE



METERING CHANNELS

BELL TELEPHONE SYSTEM

case history

no oil migration

This series of Okolite-Okoprene equalizer bus ties is installed in the Cincinnati Gas and Electric Company's West End Station. One of the reasons for choosing this cable design for vertical runs is that it eliminates oil migration problems inherent in varnished cambric and paper-insulated constructions. This feature is just one reason why today's best buy in high voltage cables is Okolite-Okoprene.

WHY THEY'RE SWITCHING TO OKOLITE
rubber-insulated cables for use up to 35,000 volts

There is a distinct trend among industrials and public utilities toward Okolite rubber-insulated cables for high voltage use.

ADVANTAGES

1. Lighter and easier handling.
2. Eliminates sheath corrosion and fatigue.
3. Simplifies splicing and terminating.
4. Moisture does not affect the insulation.
5. No oil migration at high temperatures or elevations.
6. Flexibility simplifies installation.

APPLICATIONS

1. Transmission and distribution circuits.
2. Generator and transformer leads.
3. Vertical risers and shaft cables.
4. Submarine power cables.
5. Portable substation cables and test leads.
6. X-ray cables.

Send for this 128-page manual on rubber-insulated high voltage cable. It provides current carrying capacity tables, dimensional data, engineering information and installation procedures, complete instructions and detailed drawings for splices and terminations. Write for Bulletin WE-1075 on your letterhead to The Okonite Company, Passaic, New Jersey.

OKONITE OKONITE SINCE 1878 ***insulated cables***

1871

TYPE GA-H—CABLE TO H-BEAM FENCE POST—*This grounding connector joins wide range of standard H-beam posts to fence fabric and cable. Range of cables easily accommodated. Sizes available for grounding more than one cable. One-wrench installation.*

TYPE GD—2 CABLES TO PIPE *Clamp-type ground connector for joining range of two equal cables or single looped cable to pipe or column. Especially convenient for grounding fence posts. Wide range of sizes.*

TYPE GX—CROSSED WIRES OR CABLES—*Simple, rapid connection, easy to inspect. Recommended for crossing ground conductors in order to secure greatest efficiency in reducing voltage gradient. Connector takes wide range of sizes.*

TYPE GB—CABLE TO FLAT SURFACE *Connects wide range of ground lead cable to flat structural or equipment surfaces. Can be furnished with larger than standard size bolts for pre-punched holes in steel work. One-wrench installation.*

TYPE GP—2 PARALLEL CABLES 90° TO GROUND ROD—*Clamp-type connector joins two parallel cables at right angle to ground rod, pipe, or column. Accommodates range of cable sizes in each groove.*

TYPE GAR—CABLE TO ROD OR PIPE...PARALLEL OR 90° *Double-purpose ground connector—joins ground bus to rod or pipe either parallel or at right angles. Easily installed by tightening two nuts on U-bolt. Accommodates wide range of cable.*

TYPE GK—3 EQUAL CABLES TO GROUND ROD OR PIPE—*This connector is frequently used to join grounding conductor, grounded member, and looped ground bus, at one point. Accommodates wide range.*

TYPE GG—BRAID, BAR, LEAF, OR CABLE TO PIPE—*Joins flat flexible braid or copper bar to ground pipes, fence posts, and columns. Highly effective for grounding operating rods, switch handles, gate posts. Can be used with stranded cable by splaying ends under clamp.*

TYPE YA (HYLUG)—GROUND CABLE TO FLAT BAR—*Compression connector—one-piece terminal, easily and economically installed with Burndy portable Hypress. Available for #8 str. to 1000 Mcm.*

9 sound solutions to the problem of GROUNDING

Engineered to the same precise standards as connectors that carry continuous current loads . . . Burndy grounding connectors can be depended on to provide permanent protection against

• ARC-OVERS • ELECTRICAL LEAKAGE
• LIGHTNING • DIRECT SHORT CIRCUITS

These nine designs are available in 30 variations for connection to driven rod, pipe, cable, fence post, structures, lamp standards.

Send for the Burndy Grounding Catalog, which offers an interesting technical discussion on approved techniques, methods, and materials for proper grounding.

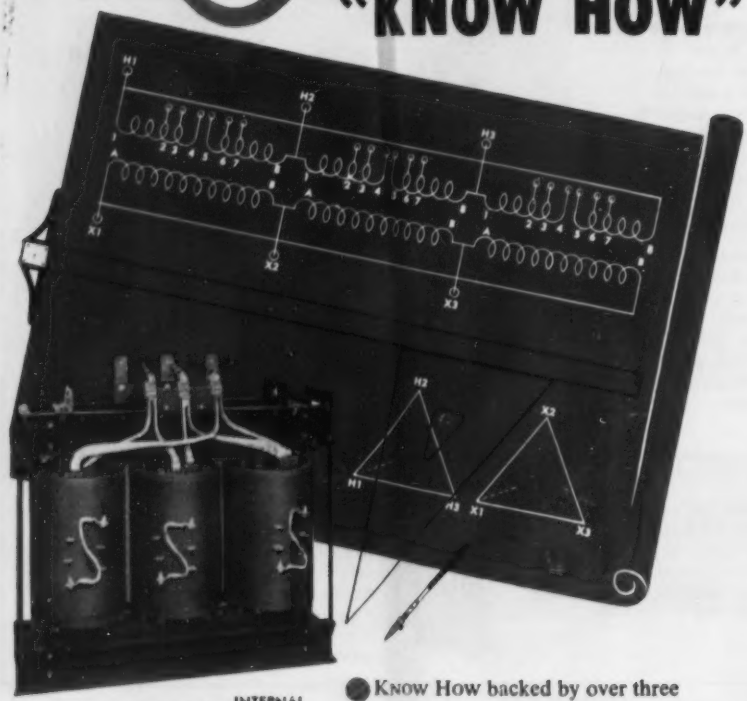
BURNDY

NORWALK, CONNECT. FACTORIES: NEW YORK, CALIFORNIA, TORONTO EXPORT: PHILIPS EXPORT CORPORATION **TORONTO, CANADA** 54-1

JEFFRIES

means 30 years of Transformer

"KNOW HOW"



INTERNAL CONSTRUCTION 500 KVA 3 PHASE

COMPLETE UNIT 300 KVA 3 PHASE

KNOW HOW backed by over three decades of experience in design and construction to produce the best possible dry type transformers... transformers that provide maximum operating economy with minimum upkeep... efficient, quiet performance with absolute reliability... eliminate long secondary conduit or bus runs because they can be installed at the load center... have low initial cost and eliminate specially constructed vaults... require no oil filtering or changing... and have Underwriters' Laboratory Approval.

Available from 5 VA to 1000 KVA in all voltage classifications up to 15 KV in standard sizes or built to specifications. JEFFRIES Engineers will be glad to discuss your requirements.

Write for additional information and illustrated catalog

JEFFRIES TRANSFORMER CO.
SUBSIDIARY OF LEACH CORPORATION
1710 East 57th Street, Los Angeles 58, California
Phone LOgan 8-3436

MANUFACTURERS OF DRY TYPE TRANSFORMERS & ELECTRICAL WINDINGS

LETTERS TO THE EDITOR

Greatly Exaggerated

To the Editor:

On p 120 of the March issue of ELECTRICAL WEST is a very interesting story about progress made by drafters of the Columbia River Compact. It will be of interest to observe action taken by the states concerned at their 1955 legislative sessions.

One error, which I want to call to your attention, is in the last paragraph, which mentions Governor West's message to the 1911 legislative session of Oregon concerning a river compact. The article says, "The late Governor Oswald West of Oregon." Happily, Os is far from dead. If you have heard rumors to that effect they are, as in the case of Mark Twain, greatly exaggerated. Further, if you hear that he is in anywise handicapped, you may rest assured it is not in the brain.

CHARLES M. SANFORD
Associated Forest Industries of Oregon
Salem, Ore.

It Really Happened

To the Editor:

A strike of engineers, mentioned in your "Electra's Husband" column recently, actually took place in March at Sperry Gyroscope Co., Great Neck, N. Y. Members of the Engineers Assn. were out two weeks haggling over a new contract which they finally signed at terms originally offered by the company.

The contract is too detailed to cover here except to mention that it included an over-all package increase of about 6.5% against demands for one including a wage increase of 15.7%. Its proposals are enclosed, should you care to peruse them.

More interesting were the varying sentiments voiced by strikers, alleged "scabs," and nonparticipants during the work stoppage.

Like the engineering professor in your article, one Sperry veteran engineer who crossed the picket lines said he disliked risking loss of friendships among the strikers but believed it below the dignity of engineers to strike. A younger nonassociation member stayed out for two days but returned when he learned other colleagues were at their desks. Another engineer refused to stay out because it was against his moral principles.

A fourth, on the other hand, remained out both weeks at the expense of a forthcoming vacation trip because, he said, he felt it was his moral duty to support his fellow workers even though not a member of the Engineers Assn.

Association members, incidentally, felt that it was lack of such cooperation by other fellow workers that made the strike fail. They were particularly disheartened when several association members began straggling back in the final days of the strike.

The engineers were supported during the first week of their walkout by more than 12,000 CIO manufacturing personnel at Sperry. Their absence kept plant machines idle. After the Engineers Assn. released them to return to work the second week,

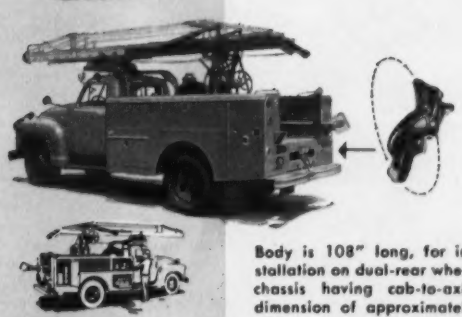
(Continued on Page 32)

POWERS *American*

Series 450 CONSTRUCTION AND OVERHEAD MAINTENANCE BODY

Does the Work of TWO TRUCKS

Ladder can be revolved 360° at elevations from 30° to 75°. In 23'6", 26'6", and 30'6" mechanical units, or 35' hydraulic model.



Body is 108" long, for installation on dual-rear wheel chassis having cab-to-axle dimension of approximately 60"

Derrick utilizes flexible steel cable instead of conventional center leg. Stows in loading area rack when not in use.

Here's a multi-purpose body that does work normally requiring two or more specially-equipped vehicles.

FOR OVERHEAD WORK . . . the body has a Powers-American mechanical or hydraulic Aerial Ladder, in a working height best suited to individual needs.

FOR SERVICE WORK . . . compartments provide space for the orderly storage of a wide assortment of tools and parts.

FOR CONSTRUCTION WORK . . . simplified, easy-to-use derrick handles poles up to 35 ft. in length. A 10,000 lb. underslung winch pays out cable beneath the body floor. A universal swivel sheave permits winch line pull in any direction, without limitation.

COMPLETE DESCRIPTION is given in Bulletin No. 118. A copy, with quotation, is yours for the asking.

POWERS-AMERICAN DIVISION
McCABE-POWERS AUTO BODY COMPANY
5900 No. Broadway • St. Louis 15, Missouri
428 Latham Sq. Bldg. • Oakland 12, Calif.

Available in Western States from the following:

AMERICAN MACHINE CO.
West 1026 Broadway
SPOKANE 1, WASH.

HOME WELDING CO., LTD.
835 Keeaumoku St.
HONOLULU 14, HAWAII

PACIFIC BODY BUILDERS, Inc.
1812 N. E. Grand Ave.
PORTLAND, OREGON

UTILITY TRAILER & EQUIP. CO.
3400 Sixth Ave. South
SEATTLE, WASHINGTON

WIN WARD COMPANY
962 Price St.
POMONA, CALIFORNIA

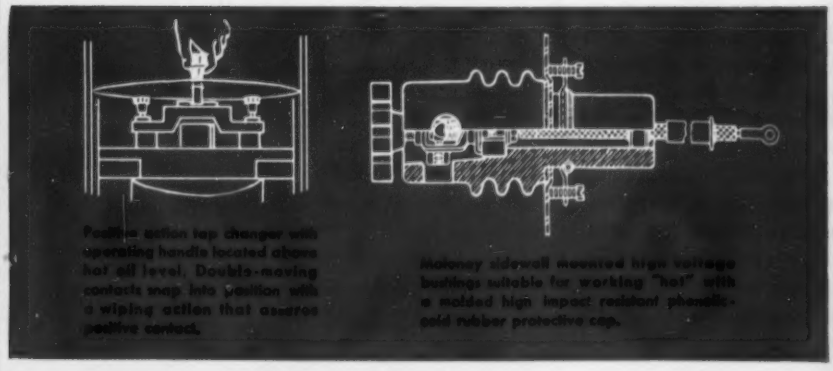
CUSTOMERS
RESISTANCE SEAM WELDED
SEALING MASTIC
Neoprene tank seal gasket completely retained by welded-in retainer ring which serves as stop for gasket and return for splashed oil. Gasket not cemented so it can be used time and again.
Tank base is pressed into tank shell and resistance seam welded. A sealing mastic compound is applied and the extending portion of the tank base is rolled in to provide protection against mechanical abuse.

BY THE ACRE

The housing developments springing up in every community have brought customers by the acre. Operating headaches by the acre have in turn been brought to distribution engineers. Feeders have to be extended . . . new substations put into service . . . secondary systems hung and put into operation quickly. For these new customers want, and expect, dependable service.

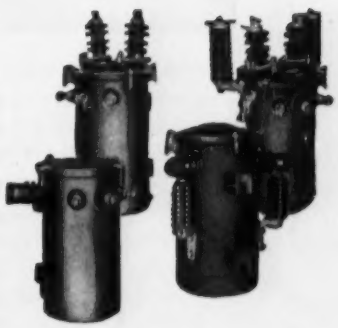
Design greater dependability into your distribution systems . . . eliminate voltage problems . . . build better customer relations by installing Moloney Distribution Transformers. To give your customers the service they deserve and assure your system of better service with less maintenance . . . make it Moloney all along the line.

MEE4-18



Positive action tap changer with operating handle located above hot oil level. Double-moving contacts snap into position with a wiping action that assures positive contact.

Moloney sidewall mounted high voltage bushings suitable for working "hot" with a molded high impact resistant phenolic-cold rubber protective cap.

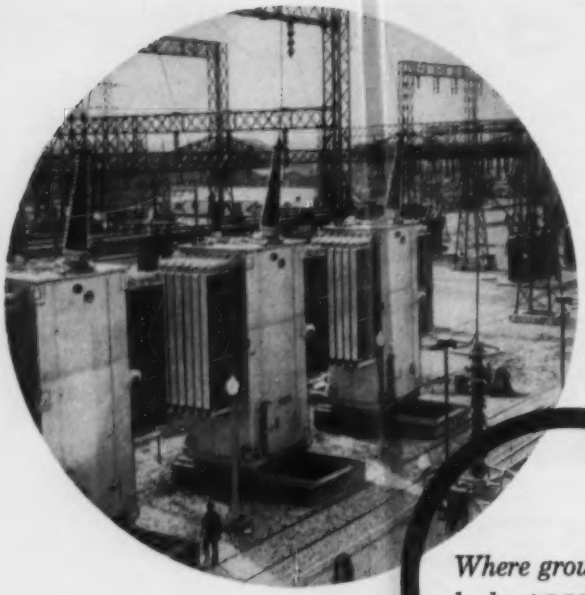


Moloney HiperCore Distribution Transformers are available in all standard ratings from 3 Kva up in both Conventional and CSP designs.

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Ratio Control Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA



Where ground must be kept **BARE** *of weeds and grasses...*

BORASCU®
WEED KILLER

BORASCU is the answer to your weed problems! Use this weed killer about stations, transformer and yard areas, fence lines, pole yards-lines, and all places where ground should be kept bare of fire-hazardous and unsightly vegetation. BORASCU destroys and prevents regrowth! A single application may keep an area cleared for 1 to 2 years! And this low-cost material is SAFE...nontoxic, nonflammable... won't corrode ferrous metals. Try it!

So Easy to Apply...

NO MIXING...
NO WATER TO HAUL
•
NONPOISONOUS
•
NONCORROSIVE
•

Write for Literature Now! **PACIFIC COAST BORAX CO.**
DIVISION OF BORAX CONSOLIDATED, LIMITED
630 SHATTO PLACE • LOS ANGELES 5, CALIFORNIA

LETTERS

Starts on Page 28

the CIO group pledged financial support to strikers pressed by never-striking food, rent, and mortgage payments.

Little or no sympathy for the engineers' strike was expressed by management at Sperry. Several of the older department heads felt sorry that the firm's first strike in more than 40 years of operation had to be called by engineers. Top officials pointed out that the company could not assent to association wage demands and maintain an equal footing in the increasingly competitive engineering market.

The future of the EA at Sperry remains to be seen. Some predict it will, like old soldiers, fade away. Others are not so sure. Still others contend it should confine membership strictly to engineers and bar the draftsmen and certain technicians now in its ranks.

At any rate most of the hard feelings evident in the days immediately following the strike have apparently disappeared. For that everyone concerned is grateful.

AN ENGINEER READER

To the Point

To the Editor:

The article on *Weather Is Our Business* by C. P. Smith of the Pacific Gas and Electric Co., which appeared in your March issue, is both timely and to the point.

It has been only since the present administration took office that the socialized status of meteorology has been pointed out by a committee of the Under-Secretary of Commerce Murray. Industry is being made aware of the importance of weather and what to do about it. Both Smith and the Pacific Gas and Electric Co. are to be complimented for the progressive manner in which they have adopted and applied meteorological knowledge to their needs.

This article also points out rather clearly the need and functions of the National Weather Service, the function of the industrial meteorologist as well as the meteorological consultant. It points out that the National Weather Service with its functions is certainly not the tool to serve the specialized problems of industry.

EUGENE BOLLAY
President
North American Weather Consultants
Altadena, Calif.

Wins Award

To the Editor:

You will be interested to know that the Douglas employees' cafeteria at Torrance* has been selected to receive a "First Award," the highest honor in its class, in the nationwide food service contest sponsored by "Institutions" magazine.

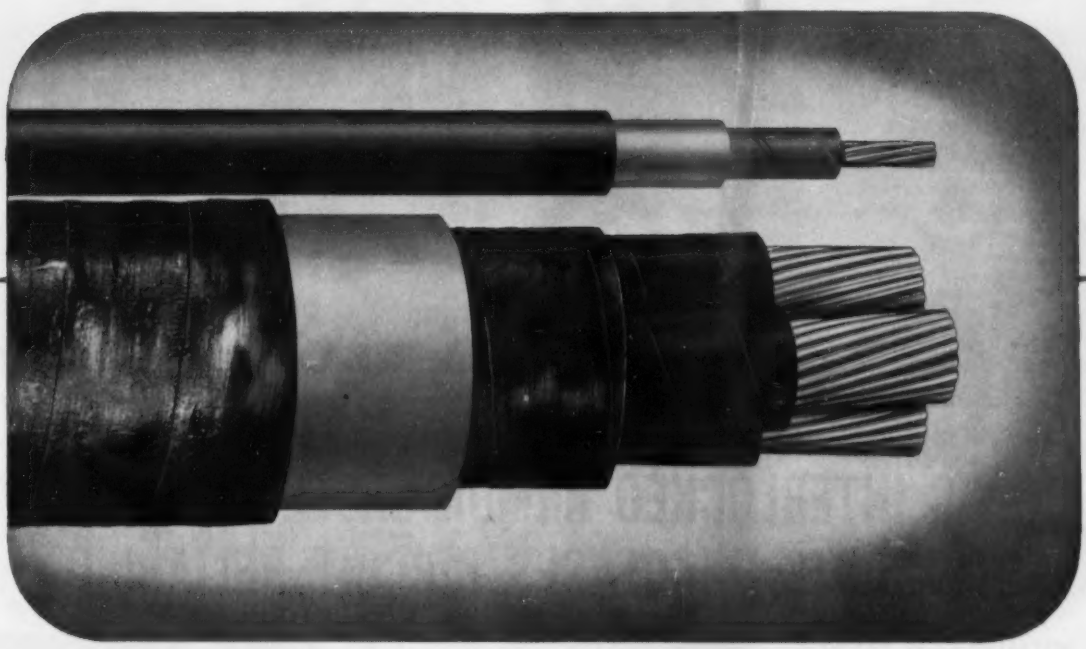
The award is to be presented at the National Restaurant Convention at Chicago May 11 . . .

E. G. ALBERTS
Commercial Heating Engineer,
Business Agent's Division
Department of Water & Power
Los Angeles

*This installation was described in ELECTRICAL WEST, April 1954, pp 82-85.

ROEBLING PROTECTIVE COVERINGS ON LEAD SHEATHED CABLE

for utilities, chemical plants and the petroleum industry



LEAD SHEATHED CABLES used in certain applications by public and private utilities, chemical plants and the petroleum industry are often impaired by electrolysis or chemical corrosion. But such corrosive action can be effectively reduced, and cable life extended, by using Roebling Paper Insulated and Varnished Cambric Cables with either of two outer protective coverings.

One of these coverings is an extruded thermoplastic sheath employing a special high-molecular weight polyethylene. The other is ROESHEATH, built up of neoprene and neoprene-filled fabric tapes and vulcanized directly over the lead sheath. Both coverings not only provide essential protection, but, in some cases, may permit the thickness of the lead sheath to be reduced.

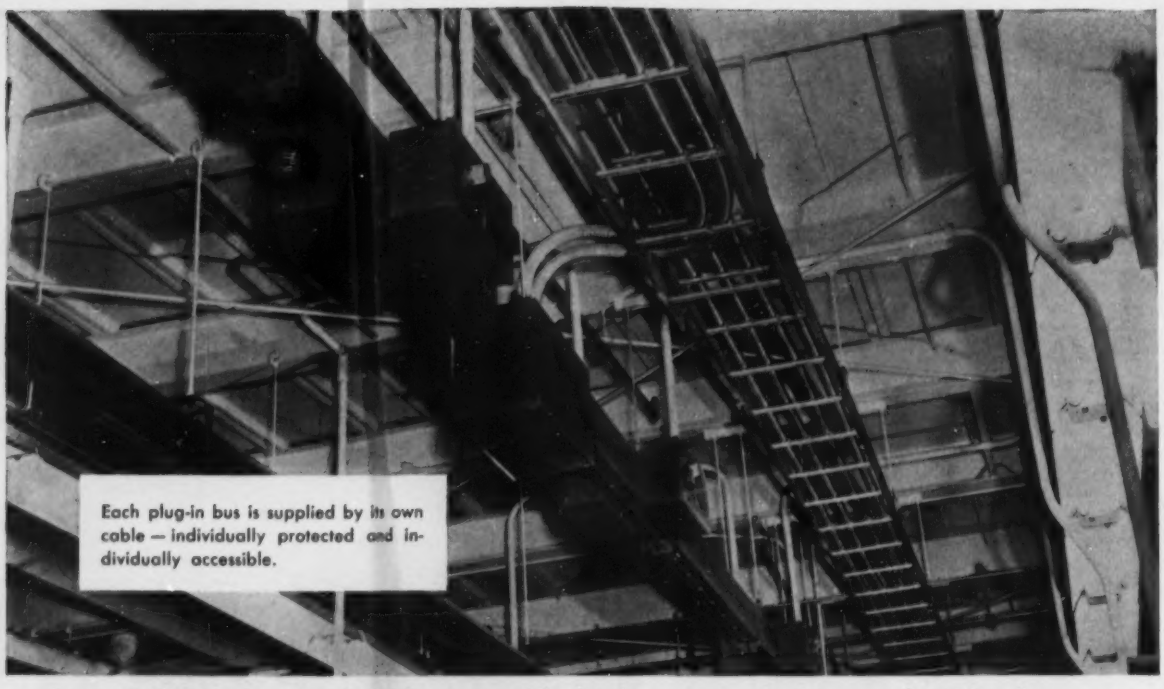
For longer, more dependable cable life and worthwhile economy write for full information... and get our recommendations for solving any special problem.

John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

A subsidiary of The Colorado Fuel and Iron Corporation

ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • ROCHESTER, 1 FLINT ST. • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY



General Electric V-c interlocked armor cable feeder system used to supply 600-volt power to plug-in bus in Cleveland plant of Industrial Rayon Corporation, because . . .

V-C INTERLOCKED ARMOR CABLE SYSTEM CUTS COSTS, INCREASES CIRCUIT RELIABILITY

INSTALLED COST SAVINGS

Many industrial concerns are taking advantage of the economies of a G-E V-c interlocked armor cable system. Industrial Rayon Corp., for instance, found that a G-E cable system was by far the most economical means of secondary distribution. Costs were low because the flexible interlocked armor cable could be installed fast—indoors or outdoors, around corners, over beams, and in long runs. The cable was installed on low-cost aluminum racks hung from the ceiling, and spliced with simple mechanical joints. Both engineering and installation time were cut.

INCREASED RELIABILITY

Circuit reliability is increased because each plug-in bus is fed by its own individually protected cable, and is less apt to be affected by any fault that may occur in another circuit. Also, the aluminum armor and racks are better able to withstand the corrosive conditions in certain parts of the plant.

Whether you're planning a wiring system for a new plant or modernizing an existing system, G-E varnished-cambric interlocked armor cable offers you reliable service with savings in both time and cost. Consult your G-E cable specialist, or write Section W 111-525, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

The cable bends easily. Corners and projections present no installation problem.

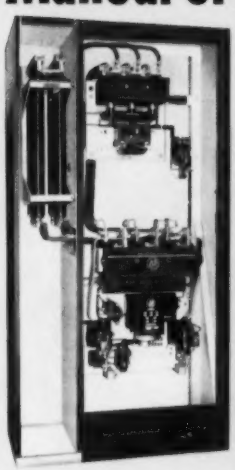
You can put your confidence in—

GENERAL ELECTRIC

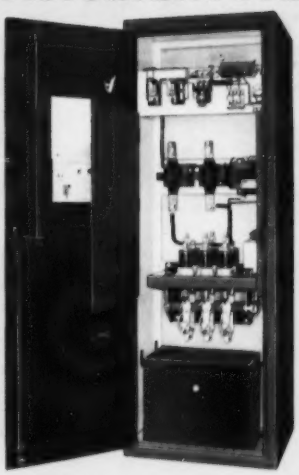
BIG ALLEN-BRADLEY MOTOR STARTERS

Allen-Bradley starter on motor-driven compressor in plant of Charles Pfizer & Co., Brooklyn, N. Y.

Manual or Automatic Starters Up to 1500 HP-4600 V



Bulletin 740 Size 6 resistance starter with adjustable graphite disc compression resistors.



Bulletin 1109 high voltage across-the-line squirrel cage automatic motor starter. Has 3-pole oil immersed contactor.

BIG MOTORS need dependable starters with trouble-free contactors, relays, and current limiting fuses or circuit breakers. To meet the demands of large motor-driven machines, Allen-Bradley has developed a line of 14 different types of across-the-line and reduced voltage starters . . . for motors up to 1500 hp.

Each type comes in a wide range of horsepower and voltage ratings . . . either manually or push button operated. Every big Allen-Bradley starter consists of time-tested components that have established their individual reputations for quality and trouble-free performance.

At maximum rating, these big starters have an interrupting capacity of 10 times motor full load current. These starters are designed to be self-protecting against short circuits up to 150,000 kva on 2000-2500 volts or 250,000 kva on 2501-4600 volts.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wisconsin

Overload Protection—Two thermal relays provide reliable and accurate overload protection. Always accurate . . . always on the job.

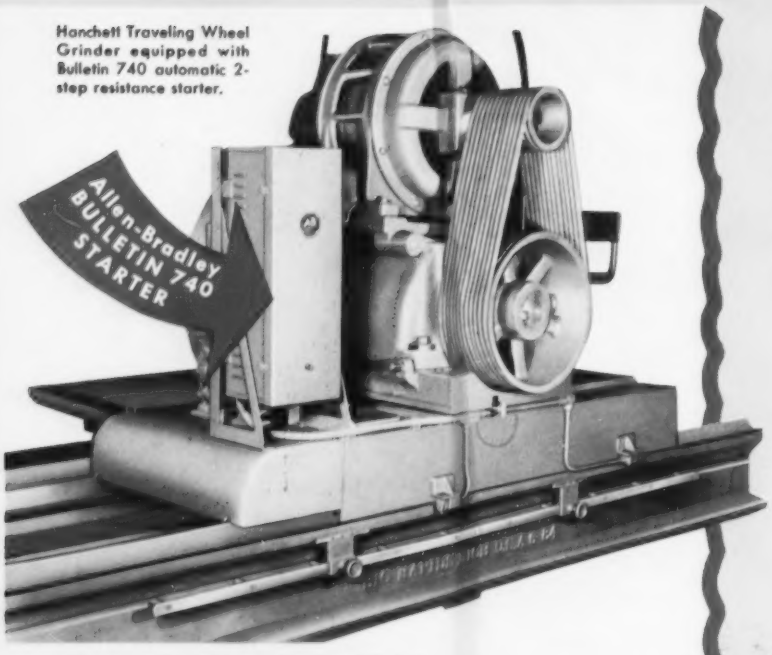
Out-of-Step Relay—The squirrel cage winding of synchronous motors is provided for starting only, and is susceptible to injury through overheating if the motor operates at subsynchronous speed for more than the safe allowable starting time. An out-of-step relay is therefore provided on all A-B synchronous motor starters. The relay is a fluid dashpot type of time delay overload relay.

5-54-M

A-B

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

When You Need a Reduced Voltage Starter

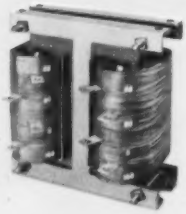


Hanchett Traveling Wheel Grinder equipped with Bulletin 740 automatic 2-step resistance starter.

Here Are 6 Allen-Bradley Starters . . . All Different

To satisfy the varied starting requirements where a reduced voltage starter is either necessary or desirable, 6 types of Allen-Bradley reduced voltage starters are listed here. They will start spinning frames, big presses with heavy flywheels, and chain or gear driven machines without jerk or jolt. For more complete data, please send for Allen-Bradley Handy Catalog—6th Edition.

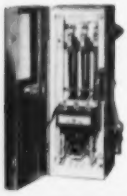
Rear view of Bulletin 640 manual compression resistance starter (removed from cabinet) showing 3 resistor tubes that are filled with graphite discs. Pressure is gradually applied on discs with hand lever which lowers the starting resistance until the motor and the machine accelerate with velvet smoothness.



Autotransformer with 50, 65, and 80% reduced voltage taps used in Bulletins 646 and 746 autotransformer type starters.

MANUAL—COMPRESSION TYPE

Manual compression resistance starter up to 200 hp, 220-440-550v. Graphite discs in the insulated tubes are compressed with the hand lever for stepless speed control. Ideal starters for chain or belt drives. Overload relay protection.



BULLETIN 640

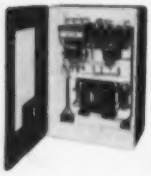
MANUAL—TRANSFORMER TYPE

Manual transformer type starter up to 125 hp, 220v; 250 hp, 440-550v. Air break or oil immersed contacts. Automatic reset overload relays. Time delay mechanism determines proper time interval for manual switch-over of hand lever.

BULLETIN 646

AUTOMATIC—TRANSFORMER TYPE

Automatic reduced voltage starter up to 300 hp, 220v; 600 hp, 440-550v. Timing relay controls the accelerating time. Operator touches Start button—the starter does the rest. Available in standard, watertight, and dusttight enclosures.



BULLETIN 746

AUTOMATIC—2&3 STEP COMPRESSION

Automatic resistance starter with preset adjustable graphite resistors up to 200 hp, 220-440-550v. Push button closes starting circuit through resistors. Later, timing relay closes running contactor and cuts out the starting resistors.

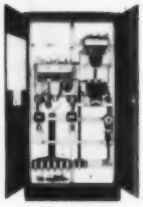
BULLETIN 740

AUTOMATIC—STEPLESS TYPE

Fully automatic resistance starter with solenoid controlled graphite disc resistors up to 300 hp, 220v; 600 hp, 440-550v. Stepless control of current and speed. Acceleration adjustable to avoid lamp flicker. Overload relay protection.

BULLETIN 742

AUTOMATIC—MULTI-POINT



Automatic resistance starter up to 300 hp, 220v; 600 hp, 440-550v. Resistors easily adjusted for ideal starting of motors on power networks. For more than 4-point control, use Bulletin 742 starter.

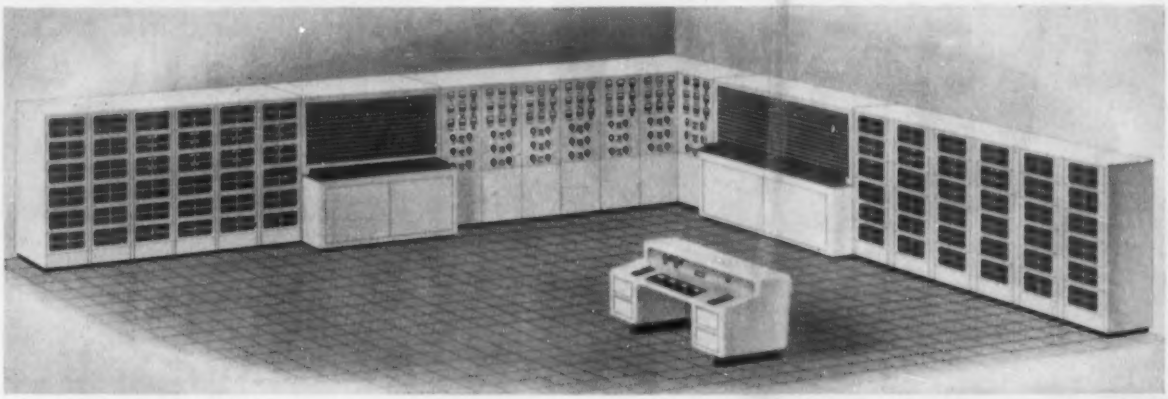
BULLETIN 741

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.

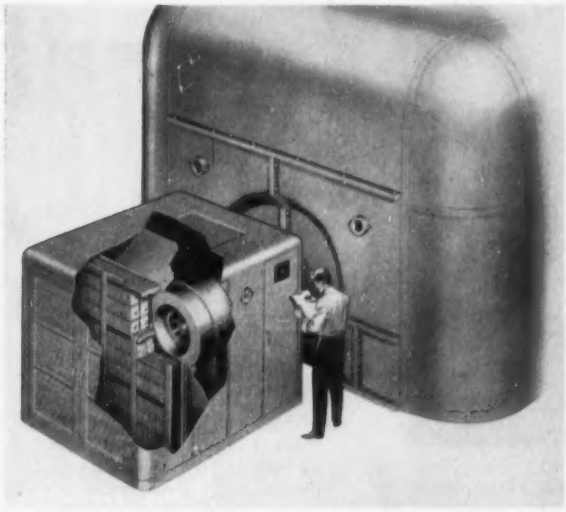
ALLEN-BRADLEY
REDUCED VOLTAGE STARTERS
QUALITY

5-54-M

PRODUCT NEWS



(1) POWER SYSTEM ANALYZER—Designed to aid in obtaining rapid, reliable solutions to complex problems resulting from continued expansion and interconnection of electrical power systems, this system analyzer features compact design, high accuracy, speed of setup and operation and low maintenance. It uses conventional 60-cycle power supply. Details may be secured from Switchgear Division, I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Pa.



Exciter System for Generators

(2) Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

A newly developed inductor excitation system, available as original equipment with turbine-generator units or for modernization of older generators, was designed to do away with two major causes of outage, commutator maintenance and brush replacement.

In the new system, brushes and commutator of the conventional exciter and all rotating windings have been eliminated by substituting an inductor alternator for the usual d-c machine. Power for excitation is generated at high frequency and then changed to direct current by a bank of selenium rectifiers. The rotating element of the new a-c exciter is adaptable to overhung mounting on most 3,600-rpm generators and in that case couplings, gears and extra bearings are eliminated, according to the manufacturer. Other than the inductor generator, only static components are used, it is stated.

The manufacturer reports that it expects the new exciter to virtually eliminate maintenance requirements and give superior reliability and performance as compared with the conventional d-c exciter-regulator system.

The inductor alternator type exciter in the new system is under the control of magnetic amplifiers through a circuit sensitive to the main generator terminal voltage. Selenium rectifiers convert the high-frequency output of the inductor alternator to direct current for exciting the main generator field and the exciter series field.

The inductor generator has inherently high reactance and is particularly sensitive to lagging power factor loads, according to the manufacturer. The control signal to the magnetic amplifier is obtained from potential transformers on the main generator terminals through a comparator circuit and a magnetic preamplifier. Output of the main generator is controlled with a high degree of amplification by using the magnetic amplifier as a variable-reactance load.

Because the exciter has in effect no time constant of its own, the speed of response as a factor delaying restoration of voltage is governed mainly by the very short time constant of the magnetic amplifiers.

Weatherproof Boxes

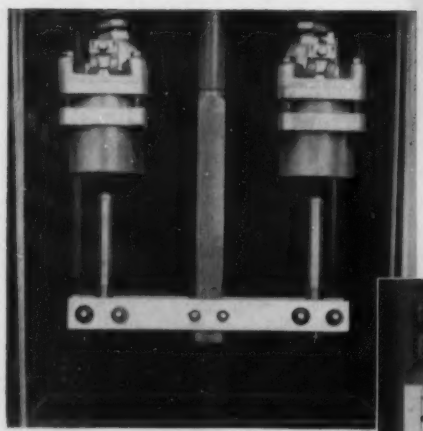
(3) Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis, Mo.

FSW series weatherproof boxes, covers and device assemblies are available as complete assemblies. The fitting is 4⅝ in. long, 2½ in. wide and 2⅜ in. deep to allow for ample wiring space. These boxes are made of Alumalloy and are nonrusting.

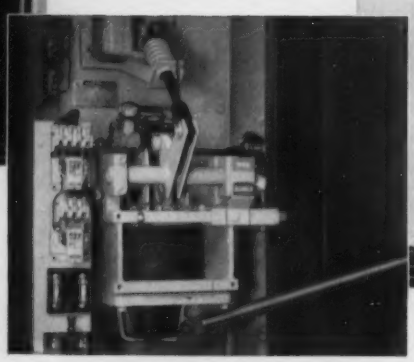
Get the breaker with these

PLUS FEATURES

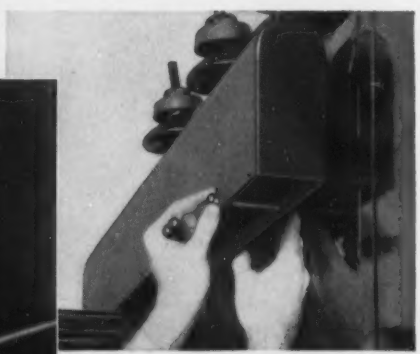
Here's Increased Operating Convenience with High Safety Factor of Tank-Per-Phase Design



TULIP AND BAYONET CONTACTS are self-wiping and self-aligning. Note also, double break per pole design and time-proved *Ruptor* interrupting device are used. Here again, Allis-Chalmers is using the same quality construction as is used on large A-C breakers.



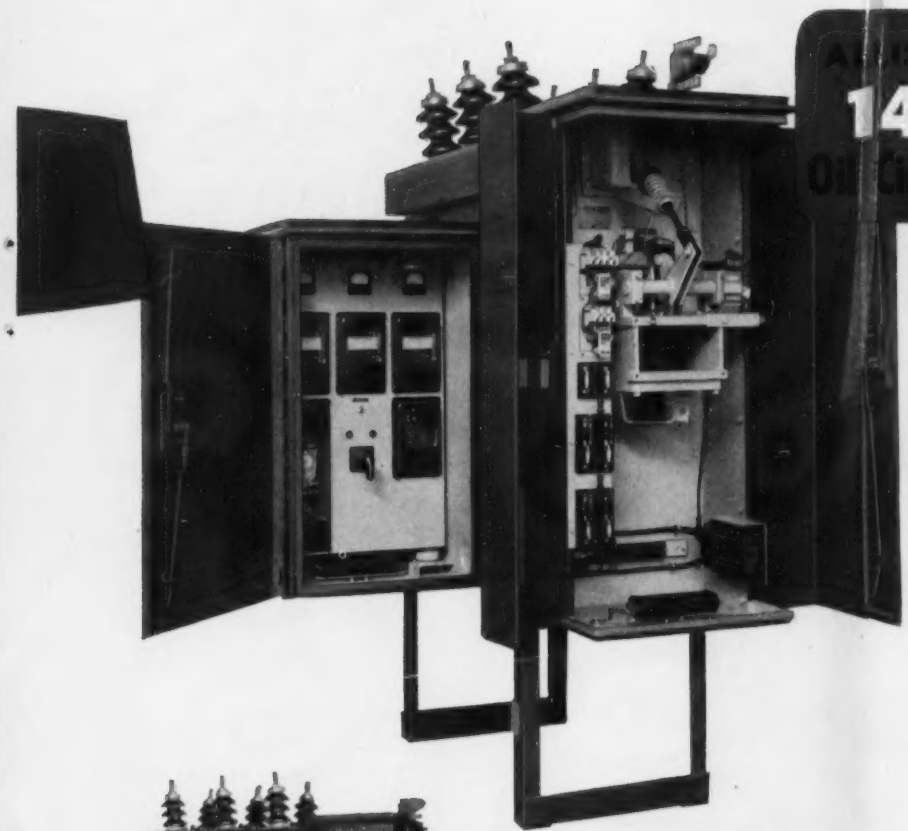
VISIBILITY PLUS. Maintenance closing device is side operated. Man closing breaker can observe contacts and man working on them. In addition, external position indicator easily visible at a distance from front or side. Inside position indicator also provided.



NO BURIED LEADS. Simply remove 3 pins and bottom of fabricated wiring duct to expose bushing current transformer leads. No conduits, pipes, fittings to remove. This is just one more well-thought-out design feature that makes this the outstanding distribution type breaker today.

A-C ALLIS-CHALMERS

ALLIS-



ALLIS-CHALMERS 14.4-Kv Oil Circuit Breakers

NO FALSE OPERATION OF RELAYS. Operate the breaker—slam the door — or let the wind slam it and relays will not operate accidentally. Relay panel is in separate cabinet from operating mechanism and is shock-mounted at 4 points. No hinge wiring either! Separate door in rear of cabinet provides access to back of relays.

ROOMY OPERATOR CABINET — Side hinging of L-shaped doors allows side as well as front access to operator cabinet. Only 7 inches of clearance needed in front of cabinet to open doors. Operator is high speed solenoid type — mechanically and electrically trip-free. Linkage is basically same as used on large A-C breakers.

BREAKER RATINGS (8-Cycle Standard Interrupting Time)

Type	Rated Kv	Rated Amps	INTERRUPTING RATING RMS TOTAL AMPERES At Rated Volts	INTERRUPTING RATING RMS TOTAL AMPERES Maximum Rating	INTERRUPTING RATING Kva	Weight of Breaker With Oil (lbs)
OZ-15-100	14.4	600	4,000	15,000	100,000	2,350
OZ-15-250	14.4	600	10,000	25,000	250,000	2,370
OZ-15-250	14.4	1200	10,000	25,000	250,000	2,470
OZ-23-250	23	600	6,300	12,000	250,000	2,370

TANK-PER-PHASE construction—as used in large breakers — effectively isolates phases and eliminates possibility of internal phase-to-phase flashover.

GET COMPLETE INFORMATION.
Call your nearby A-C district office, or write
Allis-Chalmers, Milwaukee 1, Wisconsin

Ruptor is an Allis-Chalmers trademark. A-4253

CHALMERS

Unit-Supported Bus

(4) General Electric Co., Schenectady 5, N. Y.

A new unit-supported bus of the isolated-phase design was developed to withstand the high short circuit currents of modern power systems and is claimed to have a margin for future system growth. It is used generally for direct connection of generators and main power transformers in a unit generation system.

According to the manufacturer, this equipment weighs 13½% less than present typical three-phase sections. Lighter weight and single insulator supports make for easier installation and maintenance, it is stated. The single supports reduce the possibility of insulation failure.

Company engineers explain that use of single supports was possible because the metal sheath around the bus keeps the lines of force due to magnetic flux from acting between the conductors. An area of "zero force" exists at the center of the enclosure, they say, and conductors located at this point require a minimum of support.

The new bus comes in lengths of three-phase sections up to 16 ft and ratings up to 10,000 amp, 14.4 to 34.5 kv.

Weatherproof Wire

(5) Rome Cable Corp., Rome, N. Y.

A new type of Triple-Knit weatherproof wire in which the outer braid is glass yarn is available in sizes 14 through 4 AWG.

According to the manufacturer, the glass outer braid is inherently resistant to moisture, heat, chemical action and abrasion. In addition to resisting moisture absorption, glass channels do not serve as channels to conduct moisture beneath the surface as organic fibers sometimes do, it is pointed out.

Glass yarns have a tensile strength several times higher than comparable organic fibers and retain that strength indefinitely, it is claimed. The fibers are not affected by oils and are resistant to most chemicals.

Application of glass braid to weatherproof wire follows several years of research conducted by the manufacturer and Owens-Corning Fiberglas Corp., according to the announcement.

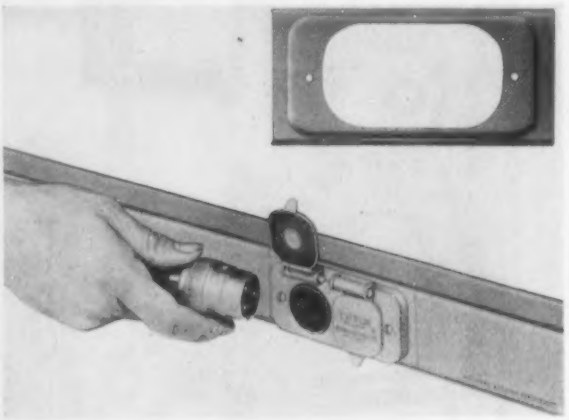
Straight Line Strain Clamp

(6) Brewer-Titchener Corp., Cortland, N. Y.

Designed primarily for use on distribution, light transmission and substation networks, this new straight line strain clamp has a bore size range of 0.46-0.90 in., holding all conductors within that range including copper, all-aluminum, 18x1 and other ACSR conductors.

According to the manufacturer, this short, lightweight, high-strength clamp can be supplied with either a drop-forged aluminum or steel body and drop-forged steel keeper. The assembly may be supplied with a drop-forged socket adapter. Use of copper or aluminum liners is recommended in steel clamps.

The smooth die-forged wave form cable seat develops adequate slip strengths, it is stated. A full 1x1¼-in. come-along eye and corona-proof design are features of BT-5100 steel and BT-5400 aluminum straight line strain clamps.



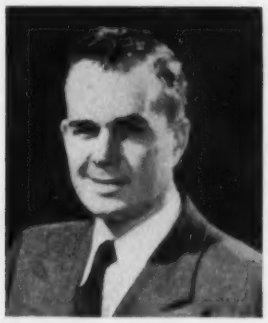
Adapter Cover

(7) National Electric Products Corp., Gateway Center, Pittsburgh, Pa.

Designed to accept the Ever-Lok receptacle device without installation of separate boxes, this raised adapter cover snaps on Surfaceduct raceway like standard capping, permits installation of the receptacle device within the body of the duct.

Although designed specifically for the 20-amp Russell & Stoll Ever-Lok receptacle, the new cover also will accommodate various other large-bodied devices, the manufacturer states. It is claimed that use of the Ever-Lok device assures permanent, secure lock of the male tap to the receptacle, thus preventing accidental disconnection of tools in continuous production work.

Installation of the device does not require stopping service or cutting channel, it is stated. The Surfaceduct capping is cut back, the new cover is installed and the device is connected.



"Here's why I buy my CABLE ACCESSORIES where I buy my cable—at ANACONDA!

"It simplifies ordering. It concentrates responsibility. It speeds up shipments.

"And it assures me of cable accessories that are designed, engineered, made and tested by power-cable specialists."

Yes, it will pay you to check your needs against Anaconda's complete line, including:

POTHEADS

Parts are *fully interchangeable* for greater adaptability, faster delivery, easier installation and lower costs. Anaconda supplies both gasket and solder-sealed types . . . your stock problem is simplified, too!

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Your cable-installation crews have everything they need for a specific joint. All the materials you need are always on the spot—never forgotten . . . never left behind—assures neat, lasting job.

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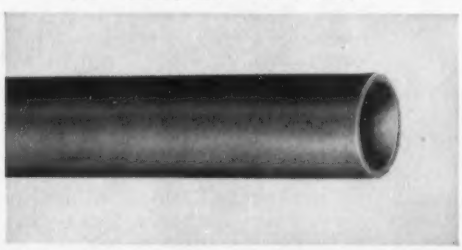

F-3 has higher tensile strength, lower creep rate, greater bursting strength, and higher resistance to bending fatigue and vibration. Specify F-3 Lead Sleeve and be sure. *Reg. U. S. Pat. Off. 54347

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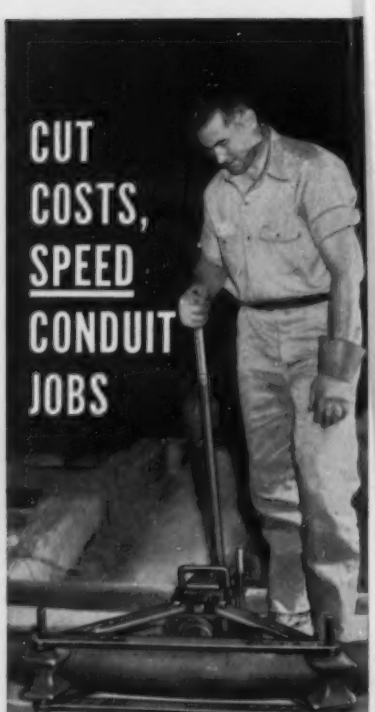

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Built for the tough jobs, the GREENLEE Bender saves hours, reduces costs on your conduit work. With a GREENLEE *one man* quickly makes bends in pipe up to 5", rigid and thin-wall conduit *right on the job*, exactly where and when needed. Many owners report time and labor savings of 50% or more . . . and the cost of many manufactured bends and fittings is entirely eliminated. Compact, portable, versatile to reduce your costs, eliminate construction delays, keep jobs rapidly moving along on schedule. Available in two sizes. Thousands in use by electrical contractors, utilities and plant maintenance departments. Often pays for itself on the very first job!

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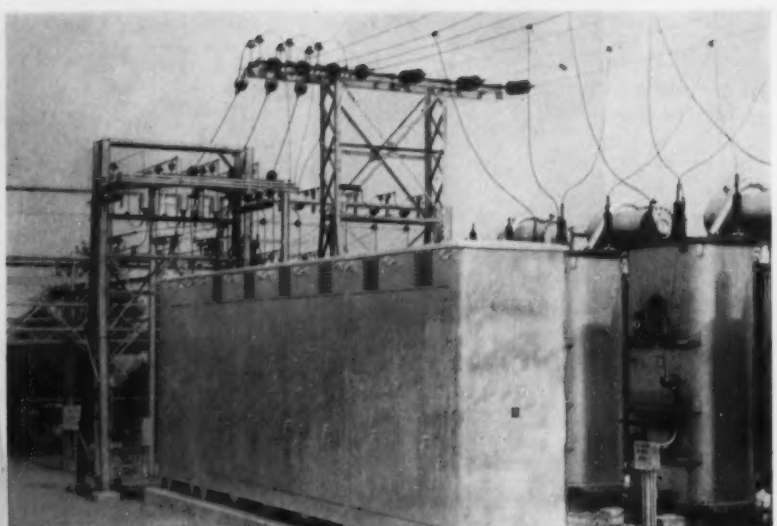
GREENLEE

GREENLEE TOOL CO.
1765 Columbia Ave., Rockford, Illinois



(8) **METAL-ENCLOSED CAPACITOR EQUIPMENTS**—For system voltages in the 2,400- to 13,800-v range, these equipments are designed for power factor improvement where space limitations or appearance require enclosed capacitors. According to the manufacturer, they also afford versatility for increasing the bank size or for moving the bank to meet changing circuit conditions. Available with or without switchgear and automatic control, they are made as individual compartments. A complete installation is assembled by combining the required compartments. Standard units come in the following NEMA ratings: 4,160 v, phase to phase, 600, 900, 1,200, 1,800, 2,700, 3,600 kvar; 4,800, 7,200, 12,470 and 13,800 v, phase to phase, 900, 1,800, 2,700, 3,600, 4,500, 5,400 kvar. Manufactured by Line Material Co., Milwaukee 1, Wis.

Power Take-Off

(9) Tel-E-Lect Products Inc., 10,001 Minnetonka Blvd., Minneapolis 16, Minn.

Designed as a heavy-duty transmission control for earth-boring equipment, the T-31 transmission has many applications of speed and rotation when used with a side-mounted power take-off on an ordinary truck transmission; can be used for control of such auxiliary equipment as winches, hydraulic pumps, farm equipment, its manufacturer states.

Features include a push-pull shift control; heavy-duty bearings; hardened 1-in. face, 6/8 pitch gears; hardened 1¼ in. diameter shafts; extra strong gear case.

Specifications per 100 rpm: low, .67; high, 1.67; hp, 5.1.

Cable

(10) Columbia Cable & Electric Corp., 255 Chestnut St., Brooklyn 8, N. Y.

An all-thermoplastic cable conforming to code specifications for use in wet, damp or corrosive locations comes in single conductor, sizes 14 to 4 AWG, and in two- and three-conductor flat construction, sizes 14, 12 and 10, with and without ground wire.

This UF cable is listed for direct earth burial in branch and feeder circuits when provided with overcurrent protection and is said to be highly resistant to acids, alkalis, lubricants, corrosive fumes and water. It is resistant to fungus and corrosion and will not support combustion, it is stated.

For More Data Fill in Coupon on Page 54

The answer to complete lighting flexibility

Fluorescent lighting on Universal Trol-E-Duct installation at Ford Motor Company's Buffalo Stamping Plant, Hamburg, New York

FORD MOTOR USES TROL-E-DUCT® —6¼ MILES OF IT!

BullDog Universal Trol-E-Duct lets Ford add, move or remove lights anywhere, anytime, without rewiring. Here's true flexibility that meets any requirement from a fixture change to a completely new floor layout.

Every rugged inch of durable BullDog Trol-E-Duct provides available easy-to-tap current. Simply slip twistout plug into continuous slot—instantly you get a positive connection without disrupting power. What's more, the 50-ampere rating of the copper bars assures ample provision for future growth.

Prefabricated duct sections install easily, quickly with only a screw driver. Can be dismantled and installed elsewhere, with never a wasted part.

For the answer to your lighting problem, check with your local BullDog Field Engineer. Or write for free bulletin UT-650. BullDog Electric Products Company, Dept. EW-54, Detroit 32, Michigan.

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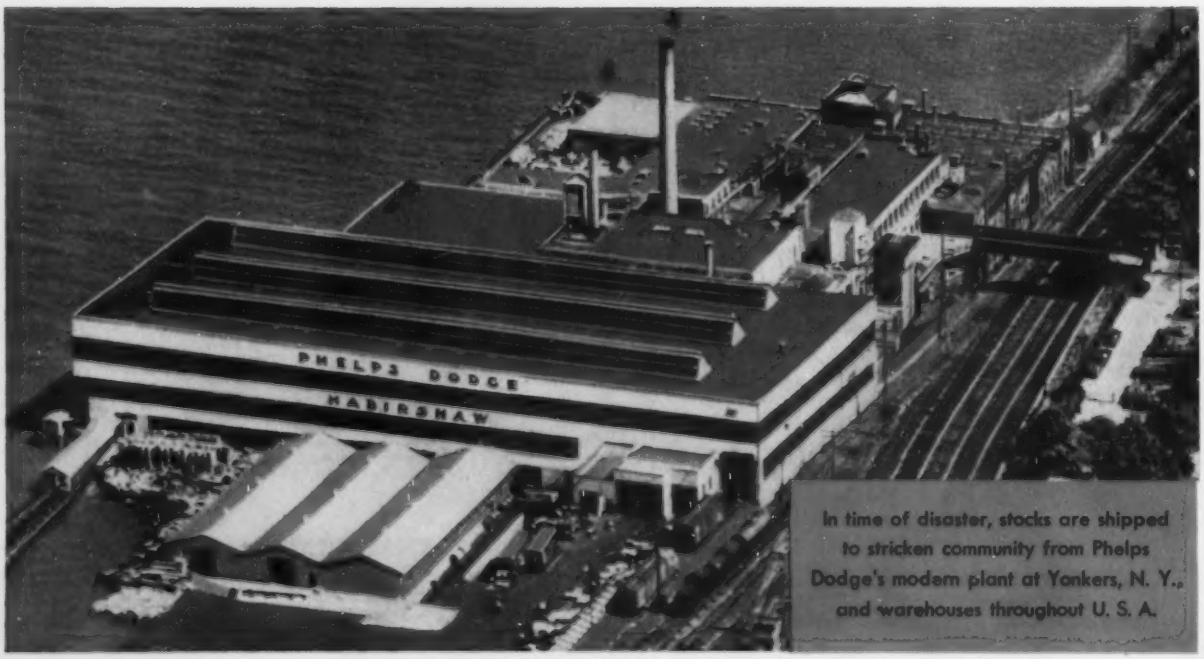
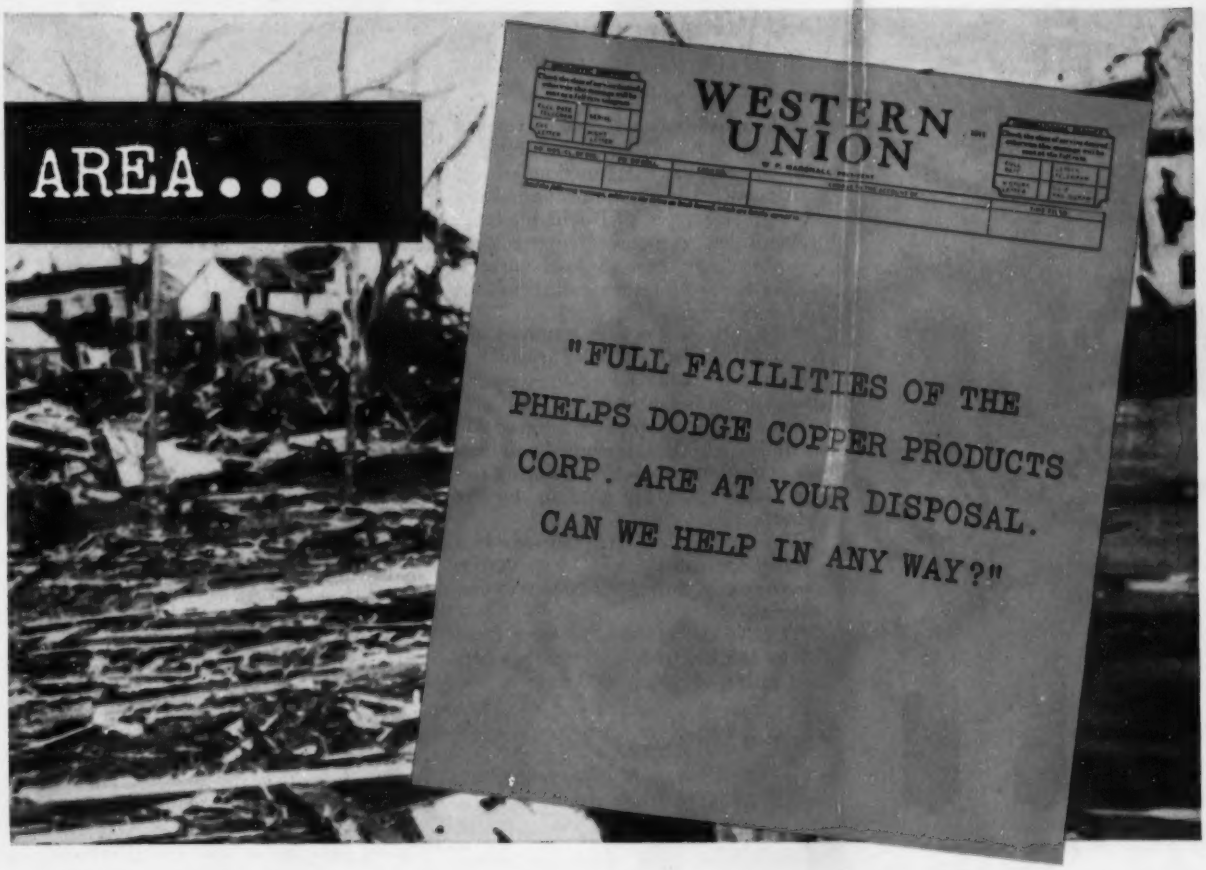
IF DISASTER STRIKES YOUR

When catastrophe hits a community, Phelps Dodge goes into action—rushes building wire and cable to local distributors in devastated area.

SEE YOUR PHELPS



In time of disaster, stocks are shipped to stricken community from Phelps Dodge's modern plant at Yonkers, N. Y., and warehouses throughout U. S. A.



DODGE DISTRIBUTOR!

Special Phelps Dodge service speeds delivery of vital wire and cable stocks to its distributors in hard-hit areas!

Telegrams like the one above are sent to Phelps Dodge distributors in areas hit by disasters. This special assistance plan is typical of the way in which Phelps Dodge cooperates closely with its distributors, assures them the finest service at all times.

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WIRE BY PHELPS DODGE MEANS WIRED FOR LIFE!

● Wherever motor and generator brushes are used in this nation, you will find "OHIO'S" products among the leaders in the field in performance. There is a reason for this!

It is our policy to firmly believe—"That the most important part of a motor or generator is the brush. Properly designed brushes will give you proper commutation, *increase* motor efficiency and performance, and will *minimize* maintenance costs." Consequently, the reputation for EXCELLENCE that OHIO products have achieved is due to expert engineering and modern methods of production. REMEMBER:—OHIO brushes represent a tiny *investment* that pays giant *dividends*.

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Load Interrupter Switch

(11) Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

A new load interrupter switch for line sectionalizing and load switching is said to combine the functions of circuit interrupter and disconnecting switch. This type VLB will interrupt transformer magnetizing currents, line charging currents and load currents up to the continuous rating of the switch.

The unit consists of a standard disconnecting switch, type V, to which is added the gas-filled load-interrupting device. Sulphur-hexafloride gas provides a highly effective interrupting medium, yet is not consumed and does not deteriorate appreciably during circuit interruption, according to the manufacturer.

The gas-filled interrupter is a parallel-connected unit that carries current only during the interrupting interval.

The switch comes in voltages from 7.5 to 115 kv, with a continuous current rating of 400 to 600 amp.

Reamer

(12) Potter & Rayfield Inc., P. O. Box 1042, Atlanta 1, Ga.

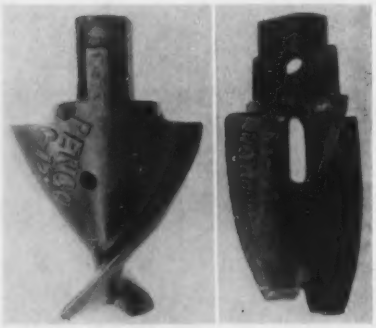
For line reaming conventional and many special types of electric motor end frames up to 12½ in. diameter, a new end bell bearing reamer is built around a horizontal gear-headed motor with an 84-rpm shaft speed. A heavy cast-iron plate supports two spring-loaded slide rods attached to a vertical face plate with a center opening to permit passage of the reamer. The face plate moves into the slowly rotating reaming tool. When reaming is completed the springs return the face plate to its original position. A momentary contact foot switch and a plug-in connection for the motor are provided.

Reel

(13) Benjamin Reel Products Inc., 10700-10710 Broadway, Cleveland 25, Ohio

Series 1,000 dual-section reel is for use on electric lighting fixtures of the pull-up and pull-down type. These reels will take either two- or three-conductor cords and have a lifting capacity of up to 5 lb and a travel of approximately 3½ ft. They are equipped with the manufacturer's patented arrangement that latches the cord at the desired length.

Fill in Coupon on Page 54



Auger Pilot Bits

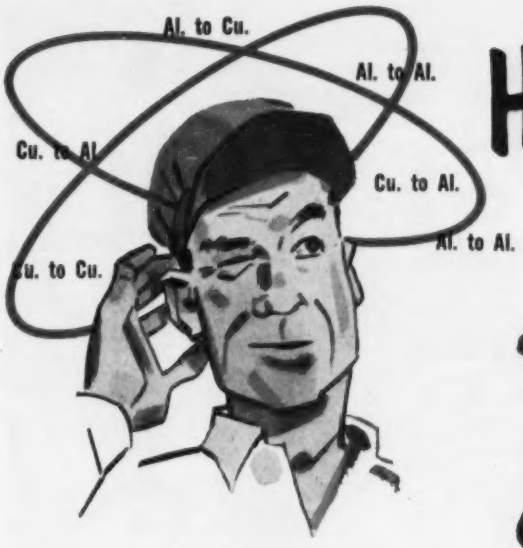
(14) Petersen Engineering Co., Santa Clara, Calif.

Designed for use in frozen ground, the Pengo combination fishtail-hardpan pilot and cone pilot supersede the former models and are interchangeable with all types and sizes of augers and boring heads made by this manufacturer.

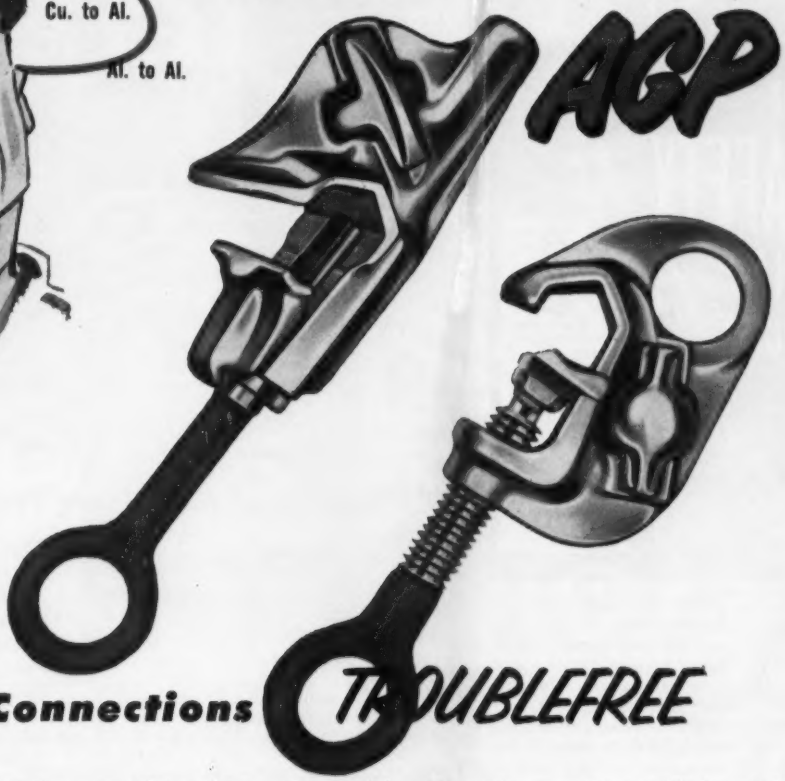
Both bits have narrow fishtails that open a small hole in hard surfaces. The forward curve moldboards of wedge-shaped design spiral their way into this hole, breaking out the hardpan or frozen ground, through which the center shaft of the auger may pass.

The manufacturer claims that the bit is designed to screw its way in, making penetration sure and effective, and that much of the strain is in compression, making it possible to heat treat the steel to near brittleness point without danger of breaking. Because of this forward curve and spiraling position, the moldboards are said to be self-sharpening. They are positioned to deliver the spoil to both sides of the center shaft, thereby clearing a path. Diameter of the upper end of the hollow cone is just large enough to accomplish this, so that frozen ground, wet clay and other sticky materials will not pack under the auger's center shaft, the manufacturer points out.

(15) METER-TIME SWITCH — A new type combination watt-hour meter and time switch, designed to control off-peak water heater loads, has been announced by General Electric Co.'s Meter and Instrument Department, Schenectady 5, N. Y. This type IR-50 utilizes features and advantages of the type 1-50 single-phase watt-hour meter. The device has been designed so that the time switch is a completely separate assembly from the watt-hour register. The meter is available with both single-rate and double-rate registers, the former registering only the off-peak water heater load and the latter registering the total load on one set of dials and the house load alone on the other set during on-peak periods. Both meters have 40-amp contacts and can be supplied with either single-pole single-throw or double-pole single-throw switches and with either a socket-connected or bottom-connected base.



Here's the solution!



Keeps Tap Connections TROUBLEFREE

Chance AGP Tap Clamps, the first successful multi-purpose clamps, solve today's tap connection headaches. AGP Clamps can be used successfully with Aluminum to Copper, Aluminum to Aluminum, Copper to Aluminum, or Copper to Copper. That's because they are given a *properly applied coating* of high-density, fortified cadmium—to a thickness of .001". Tests undertaken by conductor manufacturers and several large power companies ... and actual field service, all prove that Chance cadmium coating resists corrosion and electrolysis in all types of connections.

Heat treated aluminum alloy bodies are light in weight. This makes them easy to handle on a clamp stick and lengthens conductor life by minimizing the effect of vibration.

Contacts stay tight—the thermal expansion of the clamp is uniform with aluminum conductor ... and since the thermal coefficient of copper is less than that of aluminum, the clamp will not deform copper conductor even under extreme temperature variations. The conductor is protected at all times.

Specify Chance AGP Clamps to solve your tap connection problems. They will eliminate the possibility of error in connector applications—reduce inventories—and greatly simplify your stocking problems. AGP Clamps are available in both the Protected Connection (PC) and Perma-Grip designs.

* **CHANCE *Aluminum General Purpose – the Tap Clamp with the RED Eye Screw.***

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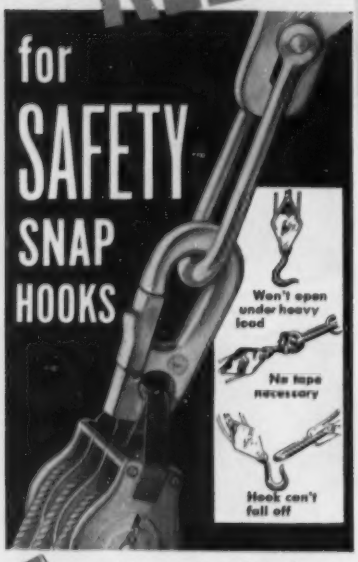

455 Solid Eye

Here's strength, safety on heavy loads—for blocks, tackles and hoists. Klein Safety Snap Hooks are time savers, too, eliminating the necessity of taping or wiring the throat. Made of drop forged steel—carry a working load of 8,000 pounds with adequate safety factor. Snap on easily with one hand—may be used on any conventional steel block 6 inches or smaller, or on chain hoists or snatch blocks. Four types regularly available. Specify 455-SH-3 Snap for use with 1½-ton hoists . . . No. 455-SP for double chain hoists and for attachment at housing. Klein can also supply safety snap hooks for lighter loads.

455-S Swivel Eye

455-SH Swivel Eye

Foreign Distributor: International Standard Electric Corp., New York

455-SP

Write for your free copy of the Klein Pocket Tool Guide today!

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Breaker Device

(16) Federal Electric Products Co., 50 Paris St., Newark, N. J.

A new Stab-lok circuit breaker device designed in accordance with the NECode is described as a low-cost, relatively large service switch suitable for homes or small industrial operations.

This 2068 device has six three-wire circuits, fed in parallel from the 200-amp mains. One circuit controls the lower bus, which can accommodate either eight single-pole type NA Stab-lok breakers or four two-pole simultaneous-trip breakers. With the new E slots in the enclosure bus bar, the device will be able to accommodate ten lighting breakers in the lower bus, it is pointed out.

The Stab-lok No. 3068, a similar device, is available with 300-amp mains.

Enclosure for the new 2068 is the combination flush-surface type.

Cord Set

(17) Cornish Wire Co., 50 Church St., New York 7, N. Y.

This electric dryer cord set utilizes a new molded-on three-pole angle rubber plug equipped with L-shaped grounding blades. The series 5533 plug interchanges with the new grounding receptacle made by manufacturers of wiring devices.

Available for application to 10/3 S cord or type SR range cable, the plug is rated at 30 amp, 250 v; is Underwriters' approved.

(18) **REFLECTOR LAMPS** — Narrow- and wide-beam 300-w reflector lamps with a PAR-56 bulb shape are available from Westinghouse Electric Corp. Lamp Division, MacArthur Ave., Bloomfield, N. J. Rated for average life of 2,000 hours, these lamps may be used at 115, 120 or 125 v and may be burned in any position. Feature of the new lamps, according to the manufacturer, is a powerful and accurately controlled beam. The bulb should be used with equipment that protects it from the weather and is so designed that operating temperature of the connector plug wiring does not exceed 200 C, it is stated.

(19) **KITCHEN BULB** — A new 150-w bulb with white inside-silica coating has been announced by Solar Electric Corp., Warren, Pa. It is made in a shorter length, will fit into any ordinary socket, has a medium base, the manufacturer states. Average rated life is 1,000 hours.

Lightning Arrester

(20) General Electric Co., Distribution Transformer Department, Pittsfield, Mass.

The Thyrite Magne-Valve arrester, a station-type lightning arrester, is claimed to attain 20% lower IR discharge voltage, 10% lower sparkover voltage and three times greater discharge capacity and endurance than the previous model.

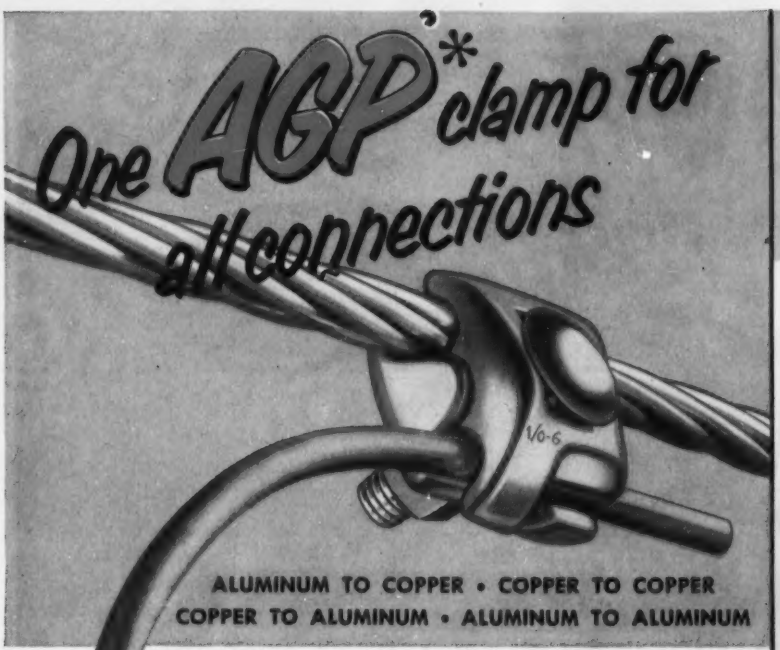
This arrester combines magnetic action of a new-type gap unit with valve action of Thyrite material. Design of gap unit includes parallel sets of gap electrodes connected in series with magnetizing coil. This gap unit has a lightning sparkover path across one gap but has the arc-interrupting path across as many as 14 multigaps. It is claimed that the new gap, for the first time, enables the arrester's sparkover sensitivity to be controlled independently of its arc-interrupting efficiency.

This gap unit operates in conjunction with an improved composition of Thyrite valve disks having low resistivity and unprecedented discharge capacity, the manufacturer states.

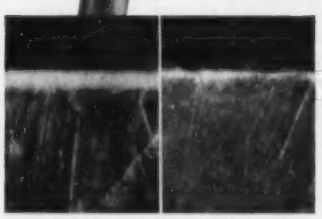
The internal elements are sealed in super-dry atmosphere within the porcelain housing of interchangeable units. The internal gaps are shunted by highly nonlinear Thyrite resistors giving self-regulating effect in controlling voltage distribution across individual gaps and across arrester units from line to ground.

These arresters come in ratings from 3 to 264 kv. The unit shown is rated 60 kv maximum line-to-ground voltage.

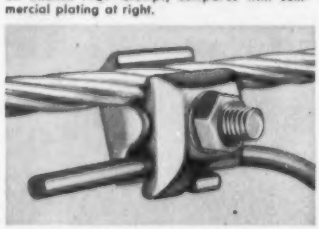
Fill in Coupon on Page 54



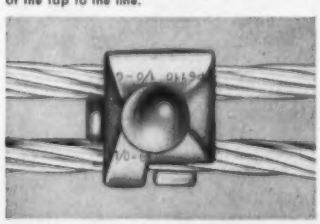
Protect your conductor with THE CLAMP THAT'S AHEAD OF THE TREND



Micro-photograph shows how high-density fortified cadmium, applied to a thickness of .001" on Chance AGP Clamps, compares with commercial plating at right.



Overlapping contacts on one side and a straight slide-in groove on the other help the attachment of the tap to the line.



Top view of clamp shows extra wide gripping jaws that contact all outside conductor strands in the entire size range.

Connecting copper and aluminum conductor requires a general purpose connector as good as the conductor itself in conductivity, mechanical stability and corrosion resistance, if future trouble on the line is to be avoided.

The best connector for this purpose is an aluminum bodied clamp with a *properly applied coating* of high density, fortified cadmium, proved best by every test for long-lasting, troublefree, general purpose connections.

That's what you get in the New Chance AGP Parallel Groove Clamp, companion to the widely tested and accepted Chance AGP Tap Clamp. The Chance PG110, shown above, can be used for any combination of aluminum or copper in a size range 1/0 ACSR to No. 6 copper *both sides*. This clamp is heavy in construction—yet light in weight. The high tensile strength bolt swivels into position without binding or bending. The wide jaws of this clamp contact every strand of any conductor in the entire size range. Rounded edges protect the conductor against damage from vibration.

Chance PG110 is your universal clamp for most applications. Larger sizes with the same features are also available. Write for complete information.

***Aluminum General Purpose**

FORTIFIED CADMIUM ...proved best by test for joining aluminum and copper conductors

Read these Statements!

They're from leading manufacturers of aluminum conductor, power companies, and research laboratories. (Names on request).

* * *

"Where outdoor weather resistance is required, *cadmium is the best metal to deposit on aluminum.*"—Laboratory.

* * *

"This is the most logical solution to the problem of making aluminum to copper connections."—Conductor Manufacturer

* * *

"All factors considered—corrosion, electrical requirements, service—cadmium plated aluminum connectors, plated according to the method used by the Chance Company, are the best possible combination for use on aluminum conductor, for aluminum or copper taps."—Conductor Manufacturer

* * *

"Your AGP connector, cadmium clad as you do it, is going to solve one of our greatest problems of making lasting A and C connections."—Power Company

* * *

"The value of cadmium plated coatings has been completely demonstrated. Their high resistance to atmosphere, corrosion, to salt spray and to alkali has made them outstanding as a corrosion-resistant coating."—Laboratory.

* * *

"I prefer cadmium because of its outstanding resistance to corrosion in contact with aluminum and because of its inherent low contact resistance."—Conductor Manufacturer

* * *

"Our research laboratory found an average cadmium coated thickness of .002" on your AGP clamps. This is considerably more than the .0005" coating implied by ASTM specification A-165 Type N.B."—Aluminum Manufacturer

* * *

"Your AGP clamps were subjected to approximately 500 hours in a humid sulphide atmosphere and after cleaning to remove the sulphide coating which had formed on the exterior they showed no evidence of a breakdown of the fortified cadmium plating."—Eastern Utility

ABC INDUSTRIES

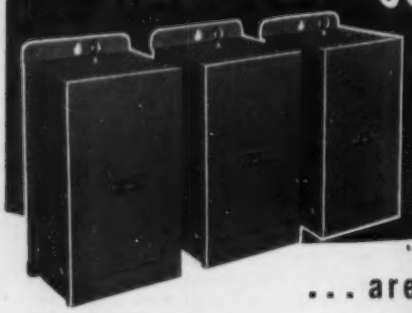
A·B·CHANCE CO.

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIFORNIA

WHERE SAFETY AND DEPENDABILITY COUNTS...

MARCUS dry type TRANSFORMERS



3 of the 19 Marcus transformers installed, with ratings up to 150 KVA.

... are STAR PERFORMERS at the Cincinnati Garden!

Feeding the power where and when needed at Cincinnati's huge and busy "Garden" is another important assignment for MARCUS Dry Type Transformers.

Because all Marcus Dry Type Transformers are now being constructed with Hi-Heat, Hi-Dielectric Magnet Wire, insulation levels of at least 10 times present industry standards are easily attained.

This factor alone, plus an enviable record of trouble-free performance and matchless dependability made Marcus Dry Type Transformers the choice of the Beltzhoover Electric Co., of Cincinnati, Electrical Contractors for the project, and A. M. Kinney, Inc. the consulting Engineer on the job.

Increase your power Performance Standards with Marcus Dry Type Transformers.

Capacities from 1 to 3000 KVA

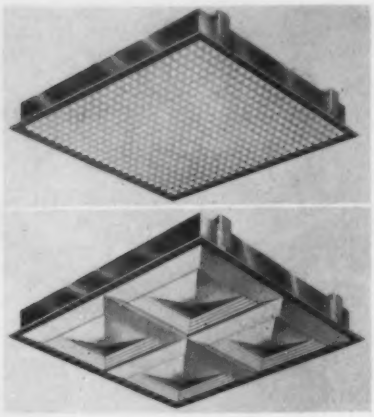
- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

"Mark of Quality"

MARCUS TRANSFORMER CO., INC. HILLSIDE 5, NEW JERSEY

Representatives in Principal Cities

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY



Large Area Lighting

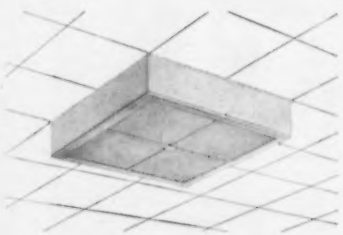
(21) Sunbeam Lighting Co., 777 E. 14th Place, Los Angeles 21, Calif.

This new large area source of high-intensity low-brightness lighting for commercial interiors is said to be most effective with high ceilings.

The 4-ft-sq (nominal) recessed light cells take four, six, eight or ten fluorescent lamps. A choice of eggcrate louver or molded plastic diffusing element is available.

The plastic shielded light square has translucent white Plexiglas and is designed to harmonize with any commercial interior. It is a single-piece molded panel on a full-length piano hinge. Light absorption of the material is said to be practically zero.

The eggcrate units give 32° shielded lengthwise and crosswise; 45° shielding is available also.

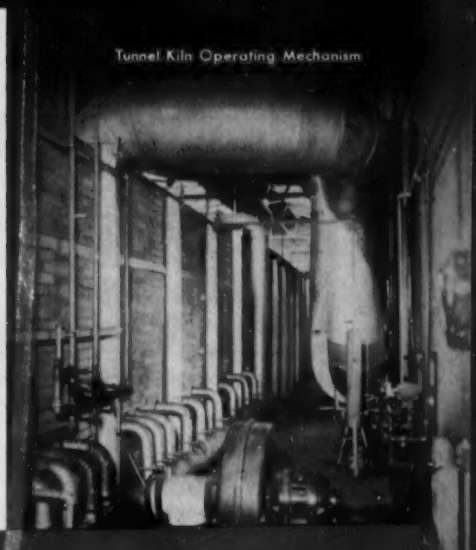


Incandescent Fixture

(22) Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3, Mo.

The Magic Lite for recessed- or surface-type installation uses regular type C incandescent lamps and the Gratelite louver-diffuser. The effect is said to be flattering to merchandise, complexions and clothing. The 24-in. square unit lends itself to various layouts either singly or in patterns. Bulletin 914 gives details.

Victor Tunnel Kiln No. 2—
(end and side view)



Tunnel Kiln Operating Mechanism

Another Reason Why—

VICTOR Makes Better Insulators

WE USE RECIRCULATING TUNNEL KILNS EXCLUSIVELY!

The firing process can literally make or break an insulator. By leaving nothing to chance, Victor "know-how" gives you the most perfectly fired high and low voltage insulators that money can buy.

Employing tunnel kilns exclusively, Victor research has done much to advance firing techniques. The use of re-circulation of heat to attain accurate, even temperature control, the use of optical pyrometers to measure tunnel kiln temperatures, automatic control instruments and silicon carbide kiln furniture are examples.

No wonder Victor *Purified* Porcelain Insulators are harder, denser, have more impact resistance, last longer and ultimately cost less! For the full story, send for our free booklet, "The Story of Victor and Purified Porcelain." Tells how research made possible this great insulator advance.

VICTOR NO. 245-R
(EEI-NEMA Class 56-3)
TRANSMISSION PINTYPE

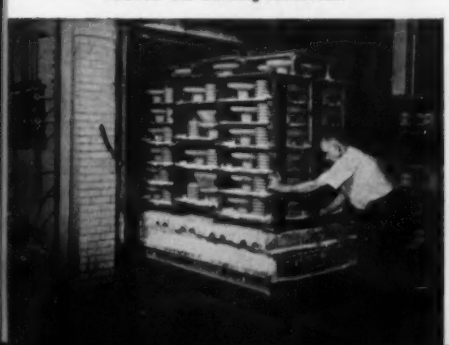
Specify

VICTOR PURIFIED PORCELAIN INSULATORS!

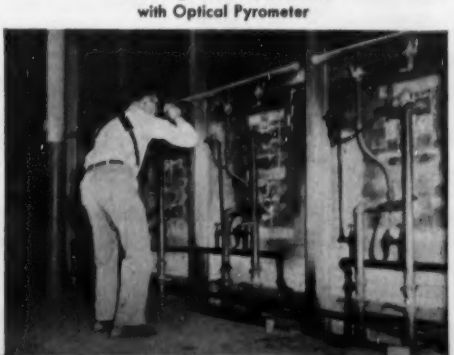
VICTOR INSULATORS, INC., VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators
• Custom Designed Porcelain • Insulator Hardware

Loaded Car Entering Tunnel Kiln



Checking Kiln Temperatures
with Optical Pyrometer

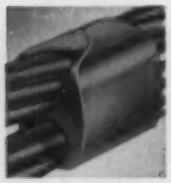


Tunnel Kiln Control Panel

HOW TO MAKE BETTER *Electrical* CONNECTIONS

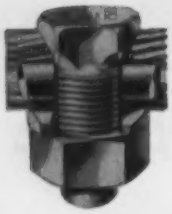
1 SELECT

the correct connector. A *connector* . . . Kearney or the cheapest . . . doesn't cost much. But a *connection* . . . completed and on your line . . . is worth hundreds of dollars. It just doesn't pay to take chances. Start out right by using a Kearney connector engineered for your job, and then . . .



COMPRESSION CONNECTOR

Built for today's loads, the Squeezon is easily installed with either the hydraulic or mechanical tool. Made in both copper and aluminum.



SPLIT BOLT CONNECTOR

The tried and proved connector with a 27-year service record. Designed for a wide variety of applications on every wire material.

PARALLEL GROOVE CLAMP

High strength clamp provides conductor separation, large contact area. Easily installed with single wrench. Wide size range.

TWO BOLT CLAMP

Available with or without spacer, the Kearney Pressurite Clamp provides a compact, convenient means to tap larger size conductors.

2 CLEAN

the conductors. Use the Kearney Cleaning Brush to remove all traces of oxidation or corrosion. Available with sure grip handle or with fit-on attachment for hot stick use, this time and trouble saver makes certain you get good contact initially. But, you have to . . .

Pioneers in the Field

Modern manufacturing facilities help keep your operating costs down.

Specify **KEARNEY**

JAMES R. KEARNEY CORPORATION • Office and Factory

HOW TO KEEP A GOOD *Electrical* CONNECTION

3 PROTECT

these cleaned surfaces against future corrosion. Kearnalene gives you two-step connection protection. (1) It penetrates any remaining surface oxide; forms a permanent conducting path, and (2) effectively acts as an inhibitor; prevents further corrosion. Finally . . .

4 SEAL

out all trouble by sealing out air from contact surfaces. Airseal prevents galvanic action by eliminating the electrolyte. Easy to apply, it is a pliable, removable, high dielectric compound. Airseal is supplied in five convenient sizes of pads and rolls.

of Solderless Connectors for Power Lines

TWENTY-SEVEN years ago the Kearney Corporation introduced the first solderless power connector. Three years ago Kearney completed development of the first practical compression connector.

And now, of all the connector manufacturers, only Kearney supplies all four of the materials shown above . . . items field-proved to be necessary for making lasting, trouble-free connections.

Standardize on this simple, complete four-step Kearney Connection System. Universal in application, it is designed for use on any conductor material, copper, aluminum, ACSR; on any kind of connection, tap, tension splice, terminal, stirrup, bus fitting, hot line clamp, ground clamp; in any kind of atmosphere, hot, cold, corrosive, wet or dry.

Kearney pioneering will continue. Kearney research, based on experience, will be ready to solve your connection problems as they arise. Look to Kearney for the answers.

MAYDWELL & HARTZELL, *INCORPORATED* • **WEST COAST DISTRIBUTORS**

Los Angeles • San Francisco • Portland • Seattle • Spokane • Phoenix

254W

Products *for Better Construction . . . Safer Maintenance*

4224-42 CLAYTON AVE., ST. LOUIS, MO. • *Canadian Plant:* GUELPH, ONTARIO

THE MILLER COMPANY

THE TRUE CRITERION OF VALUE

in lighting fixtures is continuous dependable performance. For that, look to its source. Behind Miller fixtures—Fluorescent, Incandescent, Mercury for industry, commerce and schools—are 110 years manufacturing know-how—1,000 combined man years field lighting engineering—million-dollar production facilities.

Meriden, Conn. Leaders in lighting since 1844

FIELD SALES ENGINEERS

E. J. Imhof, P. O. Box 832, Sherman Oaks, Calif.
H. D. Long, P. O. Box 427, Arvada, Colorado.
R. C. English, 3814 N.E. Wasco St., Portland, Ore.
S. Babcock, 2342 Franklin St., San Francisco, Calif.

BULLETINS ETC.

(23) FITTINGS—Aluminum clamp-type fittings for connecting aluminum conductors to copper or aluminum terminal pads are described in catalog 712 from Pacific Electric Mfg. Corp., 5815 Third St., San Francisco 24, Calif.

(24) BUILDING WIRE—A pocket-size 32-page catalog of its building wire line is available from Triangle Conduit & Cable Co. Inc., New Brunswick, N. J. A 20-page technical section is designed to give the contractor and electrician a handy reference to National Electric Code tables and other data.

(25) INSULATING VARNISH—Irvington Varnish & Insulator Division of Minnesota Mining & Mfg. Co., Irvington, N. J., has issued a new catalog. A special section entitled "How to Use Insulating Varnishes," includes general information and special instructions on dipping, vacuum, pressure, brush, spray and baking types of application. Another section has conversion tables, solvent charts, tank capacities and specific gravity correction tables.

(26) LIGHTING — An 80-page handbook on lighting shopping centers, stores and supermarkets has been published by Holophane Co. Inc., 342 Madison Ave., New York 17, N. Y. It has 110 installation photos, 64 layout plans and numerous diagrams. A section on lighting fundamentals explains how to determine lighting requirements.

(27) CIRCUIT BREAKERS — A new booklet on Stab-lok breakers is entitled "4 Ways to Improve a Modern Masterpiece"; describes four improvements in design. The booklet is available from Federal Electric Products Co., 50 Paris St., Newark, N. J.

(28) EQUIPMENT FOR HAZARDOUS LOCATIONS — Crouse-Hinds Co., Syracuse, N. Y., has a bulletin explaining why electrical equipment for hazardous locations is designed and built as it is. The illustrated booklet covers explosion pressure dynamics and tells why explosion-proof lighting fixtures, control boards and receptacles are necessary for safe operation at Class I or II locations. The bulletin is designated 2660.

(29) ALUMINUM CONDUCTORS — Milestones in development of aluminum electrical conductors are described by Aluminum Co. of America in a new booklet. The 20-page illustrated booklet traces the history of the manufacturer's research; includes listings of its basic technical reference material on aluminum conductors. It is available from the manufacturer at 725 Alcoa Bldg., Pittsburgh 19, Pa.

(30) REFERENCE BOOK — Standardization of core form power transformers is discussed by Westinghouse in a new 40-page booklet, B-5914. Technical in nature, this booklet relates developments in construction, materials and operation of type SL power transformers to the benefits the user derives from standardization of the various components, the manufacturer states. The booklet may be secured from the manufacturer, Box 2099, Pittsburgh 30, Pa.

(31) NEW PACKAGING—A catalog sheet published by Royal Electric Co. Inc., Pawtucket, R. I., shows new individual corrugated cartons for its line of Powr-Kord heavy-duty extensions. The new cartons, in various sizes, are rugged enough to be used for storing the cords when not in use, the manufacturer states.

KILL TWO BIRDS WITH ONE STONE—Fill out this one coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after July 1

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 31

If described in advertising, fill in page number

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NAME..... TITLE.....

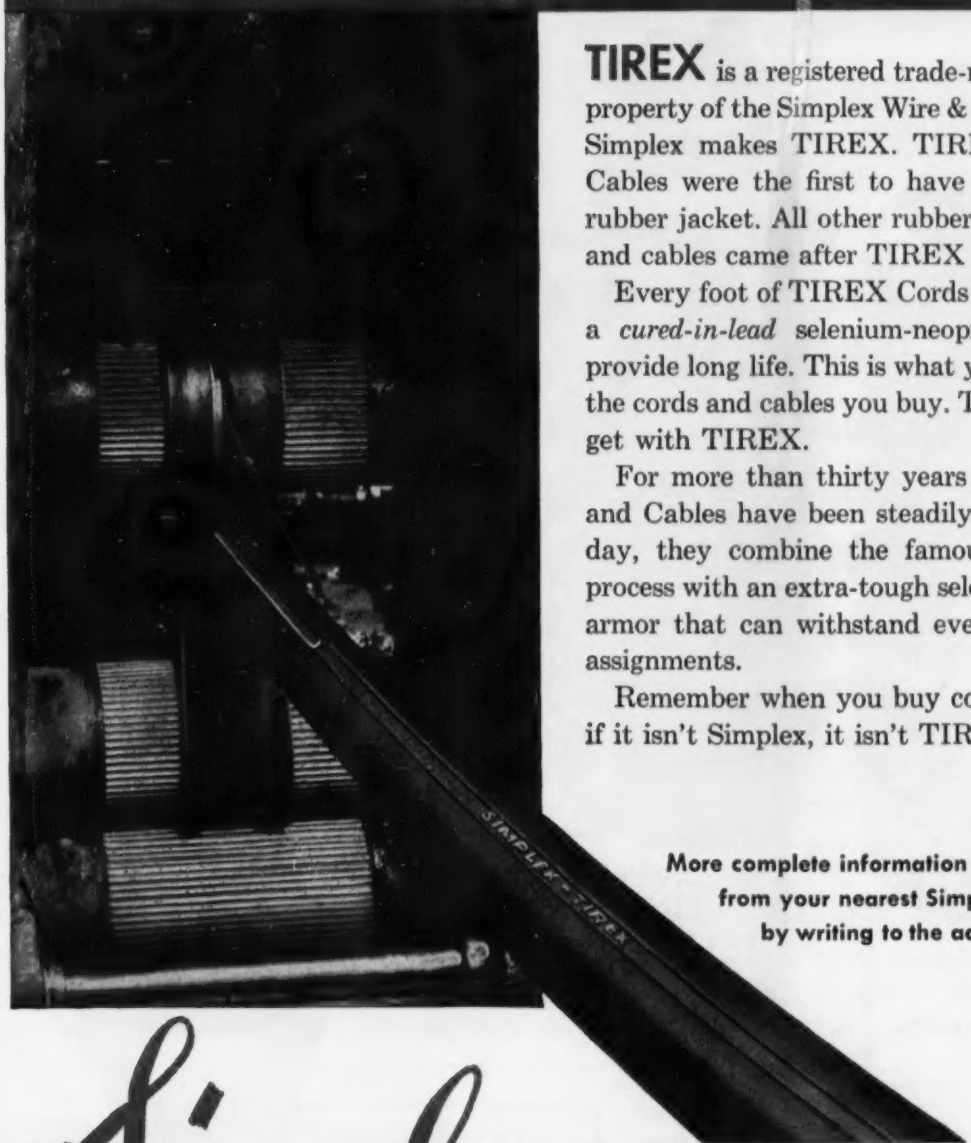
COMPANY.....

ADDRESS.....

CITY..... ZONE..... STATE.....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

If it isn't SIMPLEX ...it isn't TIREX!



TIREX is a registered trade-mark and is the property of the Simplex Wire & Cable Co. Only Simplex makes TIREX. TIREX Cords and Cables were the first to have a hard service rubber jacket. All other rubber-jacketed cords and cables came after TIREX was developed.

Every foot of TIREX Cords and Cables has a *cured-in-lead* selenium-neoprene armor to provide long life. This is what you expect from the cords and cables you buy. This is what you get with TIREX.

For more than thirty years TIREX Cords and Cables have been steadily improved. Today, they combine the famous *cured-in-lead* process with an extra-tough selenium-neoprene armor that can withstand even the toughest assignments.

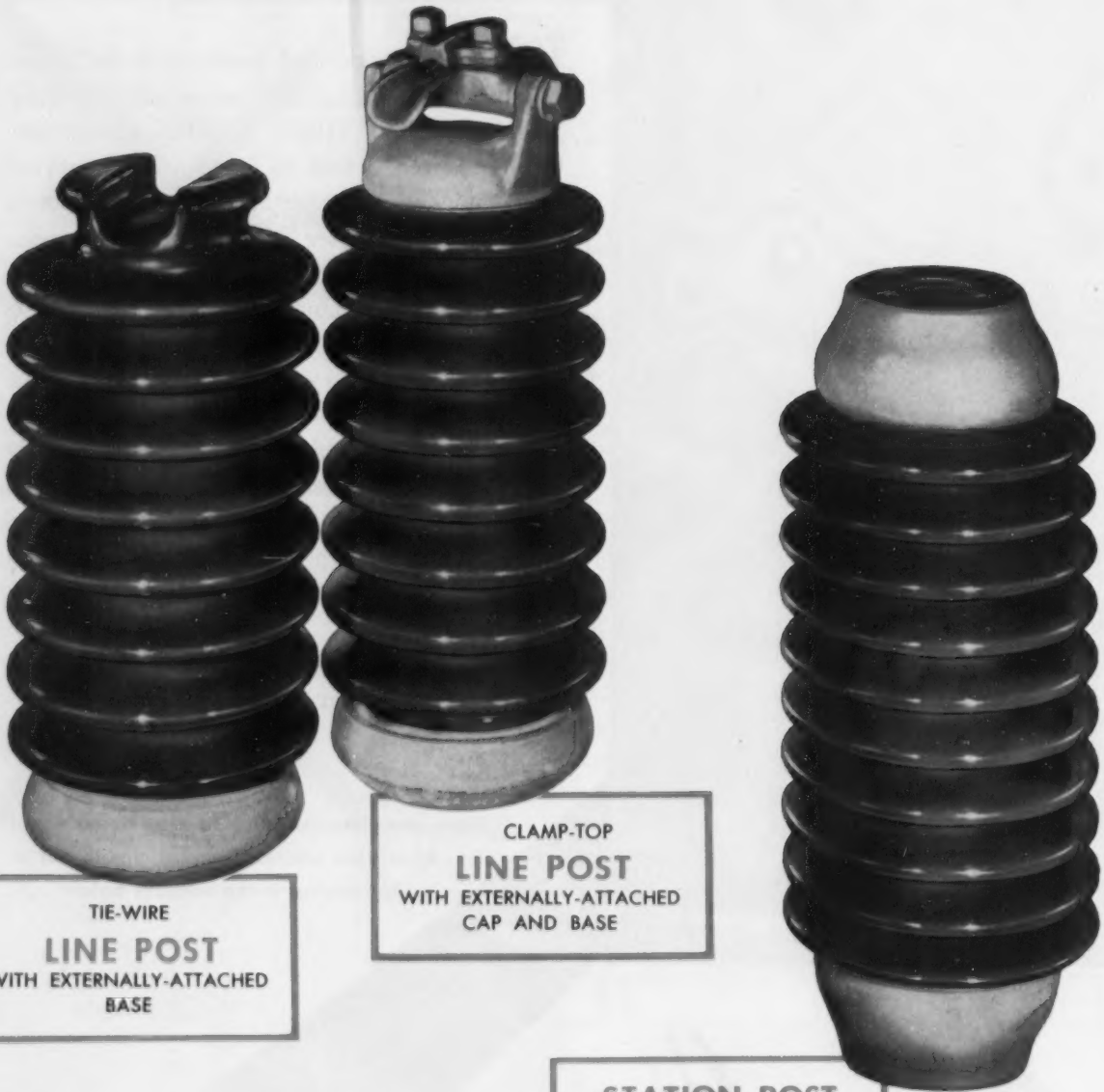
Remember when you buy cords and cables, if it isn't Simplex, it isn't TIREX.

More complete information may be obtained from your nearest Simplex distributor or by writing to the address below . . .

Simplex **WIRES & CABLES**

. . . . . SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass

the only insulators..



TIE-WIRE
LINE POST
WITH EXTERNALLY-ATTACHED
BASE

CLAMP-TOP
LINE POST
WITH EXTERNALLY-ATTACHED
CAP AND BASE

STATION POST
WITH EXTERNALLY-ATTACHED
CAP AND BASE

. . . FOR TRANSMISSION LINE AND STATION USE . . .

built to take advantage of the inherent strength of porcelain

CHARACTERISTICS OF LAPP VACUUM-PROCESS PORCELAIN:

Specific Gravity	2.41
Density	.087 lbs. per cu. in.
Porosity	Zero
● **Compression Strength**	**100,000 lbs. per sq. in.**
● **Tensile Strength**	**5,000 to 8,000 lbs. per sq. in.**
Modulus of Rupture—Glazed	15,000 lbs. per sq. in.
Modulus of Rupture—Unglazed	10,500 lbs. per sq. in.
Linear Thermal Expansion	3.23×10^{-6} per °F, 0-600°F
Puncture Strength	
—3/8" Uniform Sections	250 Kv per in.
—1" Uniform Sections	170 Kv per in.
Dielectric Constant (1000 cycles)	6.33
Power Factor (1000 kilocycles)	.8%

Cracking of insulator porcelain is characteristically and ultimately caused by tension-loading of the porcelain resulting from relative thermal movement. Any insulator of nested porcelain parts, with internal pins, or metal inserts, must be protected against cracking by extra-thick cushions of paint, or other devices of questionable mechanical security.

A fundamental concept from the beginning of the Lapp "Post" idea has been the *elimination of the causes* of such tension-loading. *No nested porcelain parts . . . no pins . . . no metal inserts.* All hardware is externally attached, so that porcelain can be loaded only in compression—in which it is from 12 to 20 times as strong as it is in tension.

Even in cantilever, the loading is distributed over the much larger, low-intensity area of gripping attachment, as compared with the relatively smaller-area higher-intensity loading on porcelains of insulators which have internally-attached pins or inserts.

You can specify Lapp Station Posts . . . Lapp Line Posts with conventional tie-wire head . . . or the new Clamp-Top Lapp Line Posts . . . with confidence in their extra margin of operating security, long life, and low upkeep. Lapp Insulator Co., Inc., LeRoy, N.Y.

Lapp

WESTERN REPRESENTATIVES:

Los Angeles: Earl S. Condon Co.
San Francisco: C. E. Ingalls & Sons
Seattle: Charles F. James
Butte: R. E. McDonough Co.
Salt Lake City: Riter Engineering Co.

ELECTRA'S HUSBAND

APROPOS of Electra's question last month about business men talking the country into a recession, Henry J. Taylor, the radio commentator, agrees. At lunch one day recently this competent and highly informed journalist who speaks to millions each week on the General Motors' program, urged business men to think, act and speak positively.

"With 40% of this country's productive output in the discretionary category as far as public purchasing is concerned," he said, "we can easily frighten the public into snapping shut their purses and hanging onto the money they have in the bank. Then the country would be in trouble."

Fact of the matter is, Taylor says, the country was never richer. Total savings of the American people exceed $260 billion—the highest figure in all of the 132 years that savings banks have reported such figures. The total banking resources of the public is an astounding figure according to Taylor.

"There is sufficient money on deposit in the nation's banks," he asserted, "to pay off all of the outstanding consumer credit and then to buy for cash every single one of the 6,000,000 automobiles that the industry expects to build in 1954. With all of that accomplished, there would still be money enough on hand to pay cash for all of the 1,000,000 homes that will be built this year. Even then, if the public was in the mood to spend further, there would be money left to purchase every single share of stock in every company listed on the New York Stock Exchange! Business men ought to take a fresh look, get a dose of renewed faith and then start selling."

When I told Electra about Taylor's talk that evening, she had a very cogent comment.

"What was it that man you abhorred once said? 'We have nothing to fear but fear.'"

HOW to counteract some of the negative and discouraged thinking is a question that has been worrying some of the best brains in America. A couple of days after the Taylor luncheon we saw one new and strong antidote. It is a sound slide film produced by the Association of National Advertisers and the American Association of Advertising Agencies working jointly. Even Electra agreed that there is no real basis for pessimism about the future when I told her some of the context.

"A lot of the doubts and questions people have in their minds about their personal security and future come about because they do not have the facts," I said to her when we were discussing the subject. "If they had a better understanding of where we are today and where we can go, they would be bound to have faith and confidence."

LET'S THINK AND TALK THIS STORY

"You sound like the film gave you a shot in the arm," she commented. "A few days ago you were full of doubt and singing the blues."

"Like a lot of others I just have never taken the time to consider all of the changes that are taking place in this country and what they mean in terms of greater needs and greater opportunities," I countered. "They make up the inherent dynamics of our economy that can launch us into a period of unprecedented growth and prosperity."

"You sound like a sociologist or an economist," she remarked banteringly. "Drop the six-bit words and talk simply."

"I've forgotten exactly how many changes the film mentions," I resumed ignoring her sarcasm. "Population increase was one—the country is growing at an astounding rate. In five years we'll have close to 180,000,000 people. There are more new families and they are bigger too. Kids marry younger and they are having larger families. And people are living longer. Older people are more active too; they have more money to spend and they travel more."

"I can say amen to all of that," Electra reflected.

"But that's only the beginning," I continued. "There are 62,000,000 people working. That's more than a third higher than in 1939. Besides they are earning more. Discretionary spending power is five times what it was in 1940. There are lots of other changes. Farms are mechanized. More youngsters are in school and college. People are saving more. As a nation we eat better. We have more leisure for recreation and travel. Folks are moving into the suburbs in large numbers.

"Those are material things. There are cultural and material changes that are equally profound. Our horizons are broadened because of radio, TV, newspapers and magazines. Even so we read more books, buy more classical records and go to more concerts and shows than ever before. Especially significant is the fact that religious congregations have been growing at double the rate of our population. Some of it comes from the radio and television religious performances."

"Even you listen to Bishop Sheehan," she interposed. "Those are a lot of changes. What about the needs you spoke of?"

"That's where the opportunities come in," I answered. "It's the needs that these changes point up that ought to make anybody feel good about the future. Take schools for instance. With 70% more kids under five years of age today than there were in 1940, we're going to need double the school facilities in the next few years. Same goes for hospitals. The two together add up to $40 billions of new construction. Take streets and highways as another example—we ought to remodel the whole works.

"The same goes for homes. Two-thirds of them are more than 20 years old—half are thirty. We ought to rebuild and modernize whole sections of our cities as they are doing some places. The same holds for factories. Somebody figured out that just these few things would require spending $500 billion. It's the combination of the changes and the needs that add up to huge potentials and greater opportunities for practically every business and every person in America.

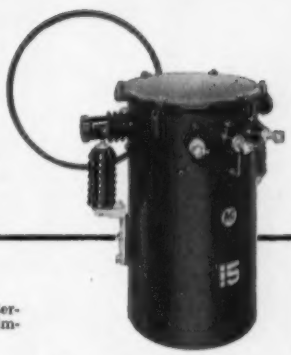
"If enough people with influence think and talk that kind of story, we won't talk ourselves into a recession."

Twist of Wrist
COMPLETES CONNECTION

ALLIS-CHALMERS
DISTRIBUTION TRANSFORMERS

TURN the clamping knob on Allis-Chalmers new high voltage sidewall bushings to complete installation connections. It grips two standard conductors as large as No. 2 stranded cable at the same time. It eliminates splicing. Connections can be made from either side of the bushing quickly, without tools. Careful engineering provides complete protection against live parts.

The new sidewall bushing is supplied on Allis-Chalmers distribution transformers 167 kva and smaller, 5 kv and below. Get complete facts from your nearby Allis-Chalmers authorized dealer or district office, or write Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin. A-4305



FEATURES

1 Large molded phenolic clamping knob with finger-grips facilitates turning. It will not fall off, even when completely backed-off. Knob collar keeps fingers away from live parts.

Convex surfaced ram, actuated by knob, forces wires against the concave surface of connector body. This snubbing action locks the cable in the connector. All parts are tinned.

3 Integral bushing electrode simplifies lightning arrester installation on transformers. Gap from bushing to lightning arrester terminal removes electrical stress from the arrester except when flashover occurs.

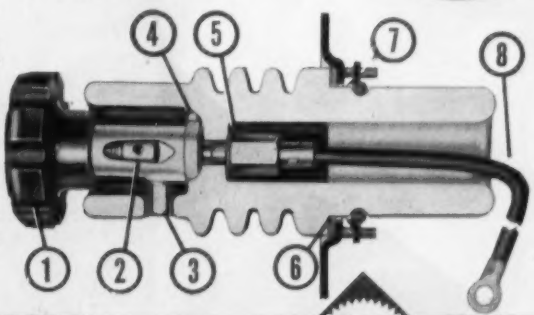
4 Connector is keyed to porcelain preventing rotation, thus protecting the gasket against twist or shear. Gasket prevents oil leakage.

5 Fibre gasket provides mechanical cushion between metal parts and porcelain.

6 Bushing is sealed in tank wall with corprene gasket. Recessed seat retains gasket for effective seal.

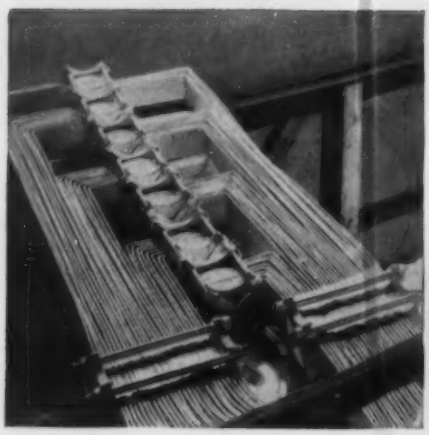
7 Internal clamping ring keeps bushing locked securely in place. Bolts exert even pressure on tank wall to produce uniform gasket compression. Internal ring helps simplify external maintenance.

8 Bushing cable terminates at terminal board. Easy removal simplifies routine maintenance.



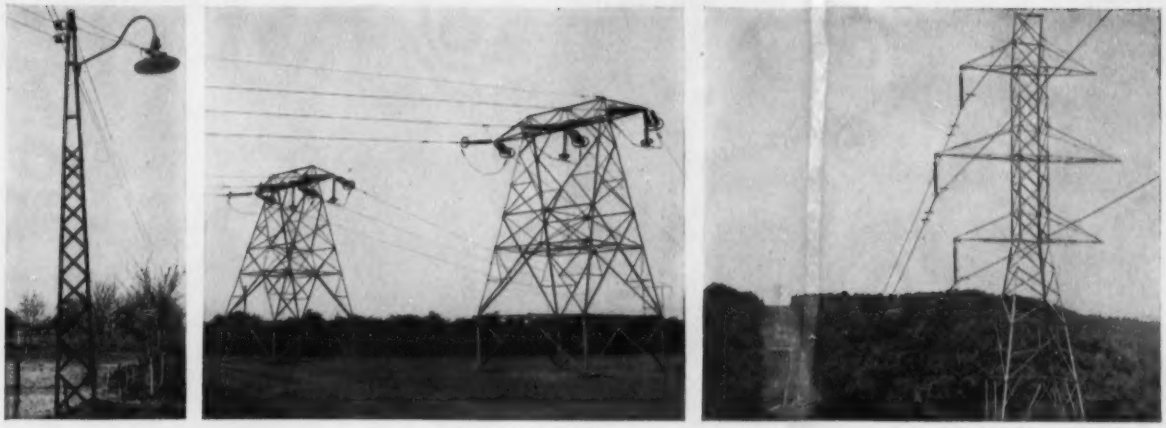
ALLIS-CHALMERS

1898 1899 1913



Let's look at the record !

1915 **1923** **1953**



1898—First installation of aluminum bus duct. An *Alcoa* first!
1899—First aluminum transmission line. An *Alcoa* first!
1913—First ACSR line in 100-kv range. An *Alcoa* first!
1915—First aluminum distribution line. An *Alcoa* first!
1923—First ACSR line in 220-kv range. An *Alcoa* first!
1953—First Expanded ACSR transmission line. An *Alcoa* first!

Alcoa has contributed the major developments in aluminum electrical conductor products for the electric light and power industry. We believe this should be an important consideration when you buy aluminum conductor and accessories. Why? Let's take Alcoa's latest, and still exclusive, development—Expanded ACSR—as an example.

Alcoa foresaw the demand for a super-voltage conductor over 20 years ago. Laboratory research into the many electrical and mechanical problems, and studies of production followed. All this and more was behind the several million pounds of Expanded ACSR we delivered last year.

Someday you'll probably be offered a similar product by someone else at a lower price.

Those savings cannot substitute for the quality that only Alcoa can offer. You get just what you pay for.

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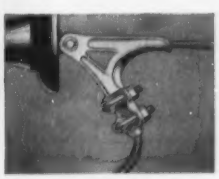
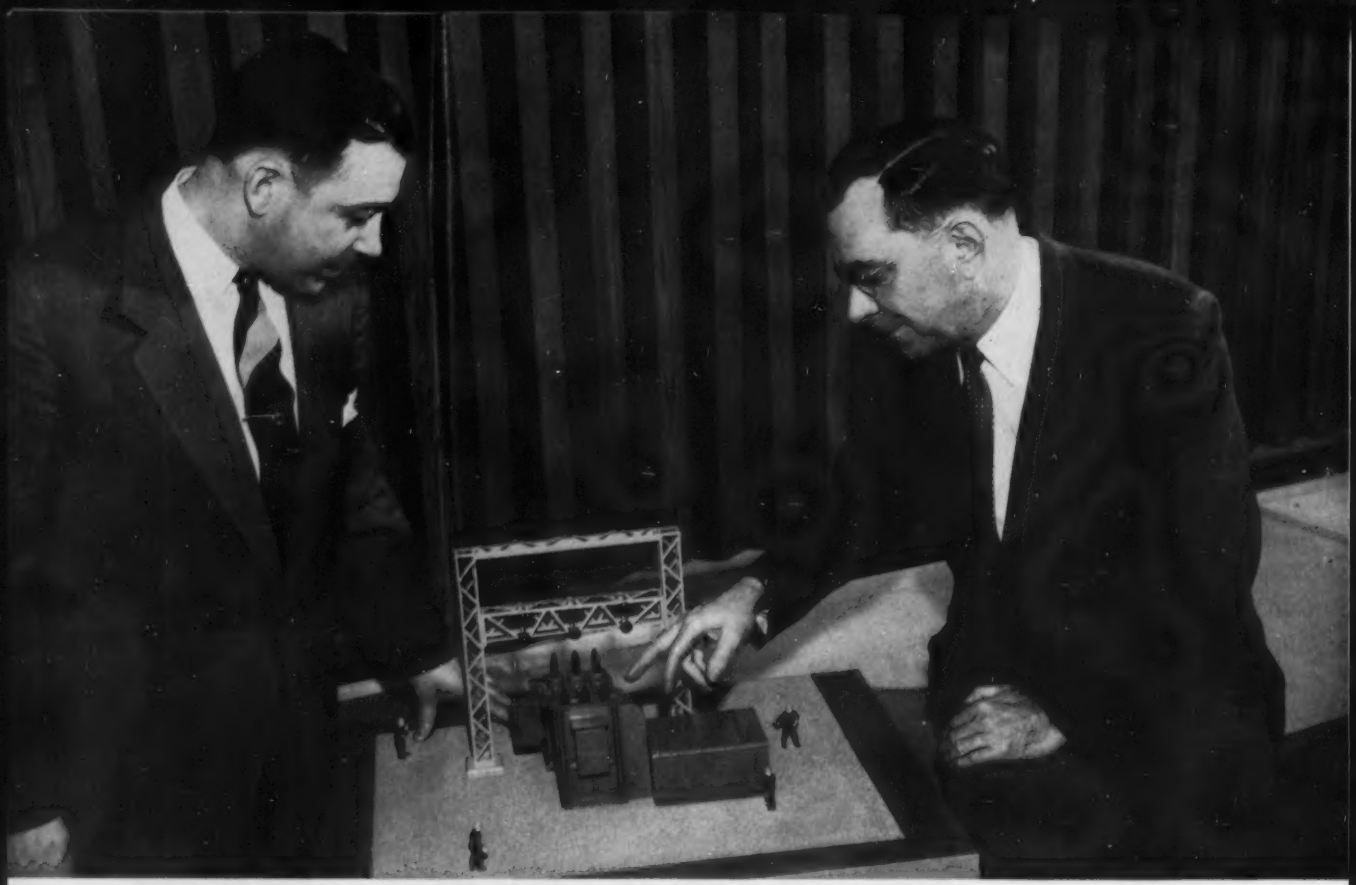
ACSR and All-aluminum Wire and Cable

Covered Wire and Service Drop



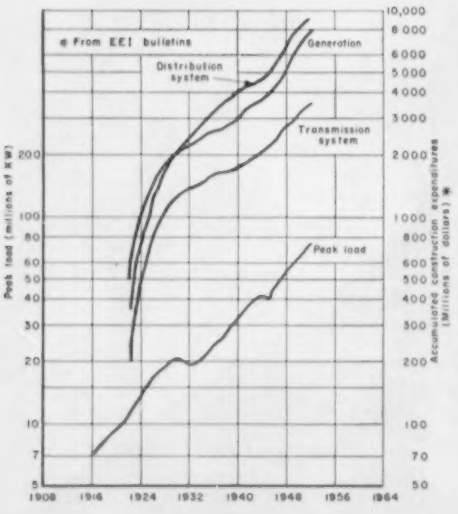
Accessories for All Conductor



PACKAGED SUBSTATIONS, like model, can be used by utilities as economical building blocks to reduce distribution investment. O. B. Falls, Utility Sales Manager (left), discusses substation layout with W. J. McLachlan, Electric Utility Engineering Manager.

Reducing distribution cost means major savings on largest part of system investment

Advance planning and building block expansion cut investment in 44% of total system



DISTRIBUTION INVESTMENT, largest single utility item for over 20 years, amounts to a billion dollars annually, is now increasing faster than peak load.

With one billion dollars a year being spent nationally by utilities for adequate distribution facilities alone, distribution is more and more the "big business" of system investment.

GREATEST SHARE

The largest single item of system cost since the early 1930's, distribution now represents a 44% share of system investment, compared with 39% for generation and 17% for transmission. Thus a utility, in constantly seeking means to reduce its greatest expense, can cut down its entire system cost proportionately.

The two important steps of (1) advance system planning, and (2) use of standardized, factory-built substations as building blocks offer a number of economies. For example, a utility's engineers, once relieved of costly substation design detail, are freed for important work of system planning for service in the years ahead. And smaller building block substations add capacity only as needed, save thousands of dollars a year by deferring investment.

ECONOMICAL EXPANSION

In working with electric utilities on distribution problems for the past 25 years, General Electric has consistently pioneered economical system expansion using the building block approach. Detailed methods are discussed in GEA-5847, "How To Reduce System Investment." For your copy, write Sect. 301-259, General Electric Company, Schenectady 5, N. Y.

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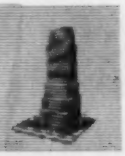


The Throat You Cut May Be Your Own

A. H. "Bill" Gudie
President
Biddle Trade Bureau
Los Angeles

That's what happens in price cutting, the industry's biggest problem today. As told to a NCEB meeting of wholesaler salesmen it applies equally to contractors, dealers and manufacturers in today's market.

Profit starvation in the midst of plenty. Here we are with the biggest volume of building construction in history, truly in an electrical age with the public clamoring for more adequate wiring and more appliances to use—yet the distributive functions of the industry are being performed without providing an adequate profit.

During the past 10 or 12 years you, in the electrical distributing industry, have done quite well. You did a lot of complaining about shortages but what you really meant was that you could not get as much material as you could sell — or perhaps I should say you could not get as much material as the customers wanted to take away from you.

The physical movement of goods in your industry is presently at a level that should provide prosperity for all, yet many if not most of you are looking at operating statements that show too little profit.

What then is the trouble?

I am told that it can be summed up in just two words—price cutting!

What is price cutting? The best definition I have ever heard goes something like this: "Price cutting is when your competitor quotes a price lower than you quoted when you tried to quote a price lower than you thought he would quote."

That definition was originally written facetiously but now, seriously for a moment, have not each one of you recently quoted a price on that basis?

Do you know what happens when you do that?

You throw out the window all your experience and knowledge of the business, all your salesmanship, all your accounting and statistics, all the things you spend money for in an effort to run an intelligent business.

It may be that someone may temporarily appear to run a successful business in that manner but if he does he will do it by cutting all operations and services to an absolute minimum. He will not need salesmen. He will not carry an adequate inventory. He will have only a negligible warehouse. He will not be able to afford good delivery service or shipping facilities. He will have to be extremely tough on credits. In fact, he will have nothing but price.

Such an operation is not likely to be successful for a very long period of time because it does not provide either the manufacturer or the public with the service it wants.

I am sure you agree with me. So why is your whole industry attempting to do it?

The Cause—Production

My answer is this: pressure of overcapacity that has caused a loss of perspective.

Since the beginning of the war, your industry has had a tremendous growth. In addition, it has undergone considerable decentralization, creating important changes in the distribution pattern. No one can say at this time whether the industry has or has not expanded and developed beyond the needs of the community.

In my opinion, the greatest damage to sound competitive business conditions in the electrical distribution business now comes from the effort of each distributor to maintain a constantly ascending sales volume.

In business we are prone to measure performance by comparing sales with last month or last year, and if an increase is not evident we begin to think something is wrong—that we are slipping. We are inclined to measure results by sales volume rather than profit. Yet it is not always the firm with the biggest volume that makes the most money.

It is the duty of every distributor to determine the role he intends to play. We usually call this establishing a policy. Having done so, he should supply his sales force with ammunition to support that policy. There is something good to be said about almost any method and it is the salesman's job to transmit those points to the customer in an effort to show him why he should buy his merchandise from a house that operates in the manner of that for which the salesman is selling.

How well are you doing this?

Perhaps at this point I should mention that I am now talking particularly about apparatus and supplies, although with only a little variation the following will be equally true in the appliance or consumer-products end of your business.

Cozy But Costly

All wholesalers have friendly customers. They are the ones that telephone in their orders day after day without waiting for your salesman. Most of the time they do not even ask the price, they take it for granted that your price will be "right." In their minds this means that you won't charge them more than some other supplier. Such customers are the lifeblood of your business. No one could

exist without them. No one can run a full-line, full-service operation on just the profit made from big negotiated projects or governmental orders.

There are no tags or name plates on these customers to say they belong to such-and-such a distributor, but there isn't much of a secret whose customers they are. Every salesman and every credit man should know who is the principal supplier of every customer. Sometimes a customer may divide his business quite equally among two or three suppliers and, if so, this too is usually known to those suppliers and their salesmen.

When such conditions exist the customer usually tries to give a preference to his normal supplier and in the event someone strange quotes him a lower price he usually passes this information along to his friendly salesman with an opportunity to meet it.

This is a nice cozy arrangement, but what a vicious competitive cycle it has spawned!

A wholesaler, in an effort to increase volume or to maintain it in the face of a declining market, goes to a contractor knowing full well that he favors another supplier and offers him some prices lower than the wholesaler is regularly quoting to his own customers. This effort to entice the contractor away from the other wholesaler usually results in the contractor passing the information along to his friendly supplier who, in turn, meets the price.

The result?

The business stays right where it would have gone but total industry volume is reduced by the exact number of dollars that the prices were cut.

Bidding for the Contractor

Let us consider for a few moments another bad practice in which some wholesalers are indulging — bidding jobs. Many wholesalers are receiving letters or post cards from contractors that read something like this:

"I am figuring the John Doe School job, please send me your bid for the material."

A large proportion of these come from contractors not regularly sold by the wholesaler, which indicates they are being mailed indiscriminately.

There is much to be said about this also being bad practice for the contractor. Suppose we reverse the situation and the wholesaler were to send post cards to a number of contractors reading:

"We are figuring the John Doe School job, please send us your labor bid."

You can readily imagine what the contractors would say.

But is that any more ridiculous? Are not most wholesalers better able to handle the financial details of a large contract? Or the negotiations? Or the paper work?

I don't advocate this. I am only pointing out that here again someone has lost his perspective—the contractor who requests that the wholesaler perform part of his functions by making a take-off and material estimate on a specific job, and also the wholesaler who does it.

Many contractors are moaning about conditions in their branch of the industry. They too should think about the functions they are supposed to perform. The more they pass these on to you or the manufacturers, the less there will be for them to do and the less they will get paid for doing it.

It is one thing to help a contractor perform his functions and quite another to do it for him.

The seriousness of this is not limited to the usurpation of the functions of one channel of distribution by another. Since the wholesaler adopts part of the contractor's methods by bidding a job, he naturally encounters some of the evils of that procedure—bid peddling. Since the beginning of the contracting profession they have suffered from bid peddling. Through various schemes they have attempted to prevent it but without much success. When the wholesaler indulges in job bidding he is certain to run into the same difficulties.

Firm Prices—for Whom?

Some contractors have been asking through their trade groups that wholesalers give them a firm price, guaranteeing that the price of material will not go up during the life of a job. Unfortunately, they want this to be a one-way street.

Some wholesalers have given such guarantees and have been burned. Not only by getting stuck when the price goes up but by having the contractor "load the job" and buy a lot more than is needed for the job being protected by the wholesaler.

It is not difficult for the contractor to get protection against a price increase if he is really sincere. All he need do is actually buy the merchandise. If he can't finance it himself many wholesalers will give such protection if they are given a really *firm* order for future delivery. The trouble begins when someone wants an undue advantage and, in your efforts to get that particular order, you are frequently being suckered into deals where you have assumed a large part of the other fellow's gamble or let him have his guarantee against a price increase with no responsibility in case of a price reduction.

There are still some contractors who complain because wholesalers quite generally sell direct to industrials who have their own maintenance departments. They, the contractors, think this business should be left to them. I am not going into the question of whether they are equipped to service adequately the industrial trade or some other equally obvious reasons that could be made the subject of a lengthy discussion. Instead, I think it more appropriate to make a new and perhaps surprising observation that contractors by their purchasing tactics are making their business so unprofitable that many wholesalers are concentrating more than ever upon industrial business!

Industrial Accounts

There are electrical wholesale distributors who do no business with electrical contractors or dealers. They sell 100% to industrial concerns purchasing for their own use. Privately, many wholesalers will admit that if it were not for their industrial accounts they could not exist.

If there is a reason for the contractor servicing the industrials, are they not digging their own grave by tactics that make doing business with them unprofitable?

How much more of a step is it before wholesalers may find it desirable to send their material bids for jobs direct to the general contractor?

Careful purchasing certainly has its place in American business methods but your industry is so interdependent that every contractor should see to it that his business is valuable to the wholesaler from whom he buys.

How often do you seriously talk over these things with your friendly contractor during the morning coffee session? Is not that the time and place to sell him on the idea that your house policy is designed to serve him best and to protect his branch of the industry? He too loses his perspective and in his effort to "get by" on some one job he may create conditions that will be a serious threat to him and his industry for a long, long time. Help him keep his perspective and you will help yourself to keep your own.

What Price Is Right?

Who is to say what is the right price?

Every wholesaler has to fit each transaction into his total operation. If he has a 15% overhead and does a certain amount of business on a 10% margin, he must do a certain volume at more than 15% so that he will average out at 15%. The variance in

prices quoted by competitors should normally result from the different appraisal by each seller of how the margin to be derived from an order fits into his over-all picture.

If such were always the case, you would have a pretty healthy industry, pricewise. Unfortunately, many prices are quoted on the basis of trying to outguess the other fellow even though there may be situations when the competitor can handle a transaction for less and still make money.

Worse yet is the habit of permitting a customer to say how much he will pay. The practice of letting your competitor or your customer determine your prices is not good business and since the amount of profit produced is the measure of how good a businessman you are it is obvious that such practices will not produce good profits.

We publish a price book that contains schedules created by several hundred different manufacturers. Each manufacturer has undoubtedly spent many hours attempting to determine the method that will sell the greatest quantity of his merchandise to the largest number of consumers. In these deliberations he has decided that he would hire *you* to perform certain functions. He has decided that the performance of those functions is worth a certain price and he has set his discounts accordingly. So now, what do you do when you cut the price?

Actions Speak Loudly

You tell the manufacturer that the service you performed for him is not worth as much as he wanted to pay. He might very well think that perhaps the services you performed were inferior and not worth more than you charged. Likewise, if he is not satisfied with your over-all result, he may feel that if he bought the higher grade services he was willing to pay for he might get the better results he is seeking. This does not necessarily mean changing distributors. It could mean he will consider a different method of distribution.

You have seen some development of that sort in the growth of manufacturers' warehouses. For some reason the manufacturer has apparently concluded that you do not carry adequate stocks, so he has put in his own.

Many wholesalers are complaining because the spread upon which they are operating is substantially the same or less than before the war.

Could it be that it is because you are not performing some of the functions you formerly did, or perhaps not performing them so well?

When you cut a price you are, by very snap judgment, throwing overboard the deliberate thinking and planning of the manufacturer whose merchandise you are selling. Perhaps you are able to do this intelligently but it may be that the reason for your predicament is that some of those snap decisions have not been entirely sound.

Obviously, the price published by the manufacturer is not correct for every situation. We all recognize that there are times when the price should be tailored to a specific situation. In such an event, just because your competitor does it differently than you does not make him a so-and-so. Perhaps you are the one who is wrong. Such differences make up the kind of good competition that makes American business hum.

Many salesmen put more salesmanship into selling their sales manager on the necessity of a cut price than they put into selling their customer.

Many salesmen think it the best alibi for losing an order to say that the other guy had a lower price and this is frequently used whether it be true or not. It is not always a safe alibi because your sales manager knows it is not always the truth.

But true or not, it is still a poor alibi. The threat of price competition is always present. It is a part of the salesman's job to get the order even in the face of a lower quotation from a competitor. How good a salesman you are depends upon how often you do that, not by the volume of business you can write if you have the lowest price.

Who Was Taken?

I have frequently heard businessmen and salesmen say that some competitor "took a piece of business" away from him. Rare is the circumstance when you really know a certain transaction is yours before you actually get it. You may think it is yours and perhaps if everyone else thought it was yours then it would come to you, but competitive business is not operated that way.

Almost always, whenever it is necessary to make unreasonable concessions to get a certain order, it is because you are trying to take the order away from the other fellow—not so much that he is trying to keep it away from you. When you begin doing this too frequently, you are losing *your* perspective and soon you are making the same unreasonable concessions to get the business that is *naturally* yours and that would be coming to you anyway.

Problems such as those that confront your industry can be solved only by planning. This means planning a complete method of operation and then sticking to it. For the salesman, that requires selling consistent with the type of operation selected by his company management. If he is working for a full-service house but only knows how to get cut-price orders, then perhaps he should go to work for a high-grader and compete with Uncle Sam's postage stamps. Somehow or other, the full-service house must get business at a price that will cover the cost of providing the full service or else go out of business.

The conditions of your industry that I have been discussing present an individual problem to each one of you, whether you be a salesman, inside order clerk or the owner of your company. If a salesman, the manner in which you solve the problem will determine your commissions or other compensation; if you work inside, it may affect your promotions; and if you own the business it probably will determine whether you will be entertaining the sheriff or the income tax auditor.

Take a New Look

Take time out for a minute and get a fresh, new perspective. In spite of all the talk about a recession, the most important readjustment ahead probably only involves a readjustment of your concept of "good business" and a realization that you can do a satisfactory job without getting every order—that you can make an adequate profit without increasing your volume from year to year. Be sure that every order you do get will stand on its own legs and contribute its proper share to your over-all operation. Above all, be sure that you are running your own business and that it is not being run by some customer who is dreaming up competition for you to meet.

During the coming year the wholesale customers in this area are going to buy a huge volume of electrical apparatus and supplies. You distributors are going to sell most of it to them. The quantity they buy will be affected very little by whether you gross 10% or 15% on it.

However, such a 5% difference could determine whether you make a profit or sustain a loss.

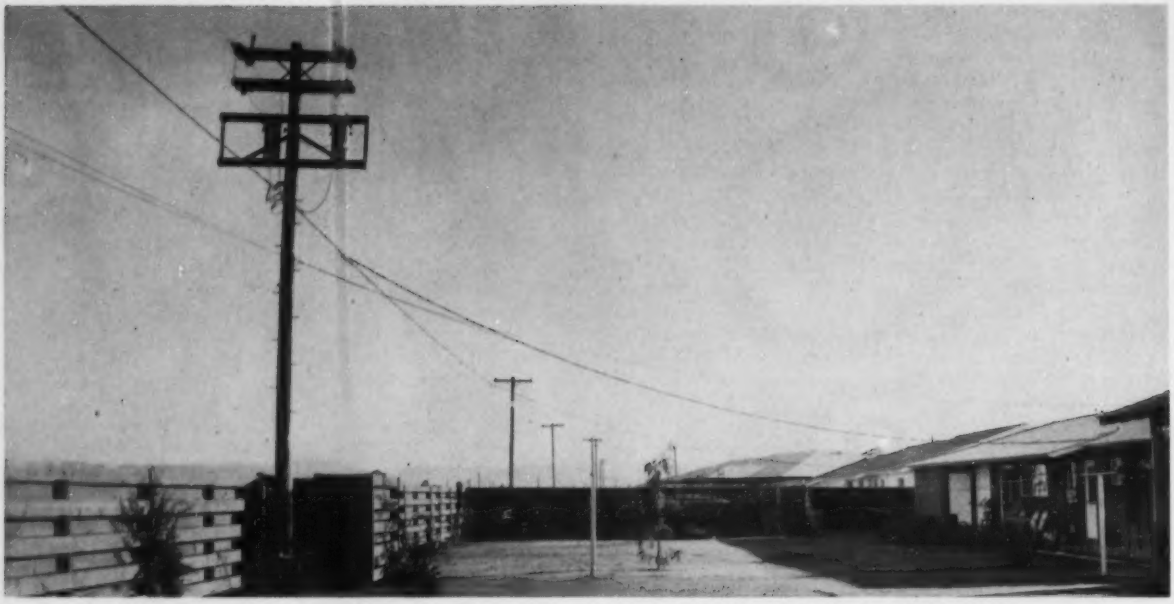
The executive of one large electrical supply house recently told me: "1954 is the year to get through."

He could be right and, strangely, it is all up to you.

The volume is here.

The manufacturers will provide the goods.

It is only a question if you are good enough businessmen to see to it that you get adequately paid for the services you render.



Serving three-phase residential air conditioning loads is no problem for Arizona Public Service. This shows construction employed

For Home Air Conditioning Will It Be

Single Phase or Three Phase?

Don Willis

General Sales Manager
Arizona Public Service Co.
Phoenix

Now Is the Hour, the title of a popular song of a few years ago, might well apply to the urgency of electric utility management in the West making a policy decision with respect to the much talked of, often disputed, practice of supplying single phase or three phase in residential areas to serve the increasingly popular air conditioning loads. Admittedly, both types of service offer advantages and disadvantages to each member of the important triangle involved—the customer, the manufacturer and the utility.

Certainly, many factors must be taken into consideration, above and beyond the customer's complete satisfaction, in arriving at a policy decision. However, the Arizona Public Service Co. very strongly feels that the customer deserves every consideration and must receive the type of service that best meets his need at the lowest possible cost.

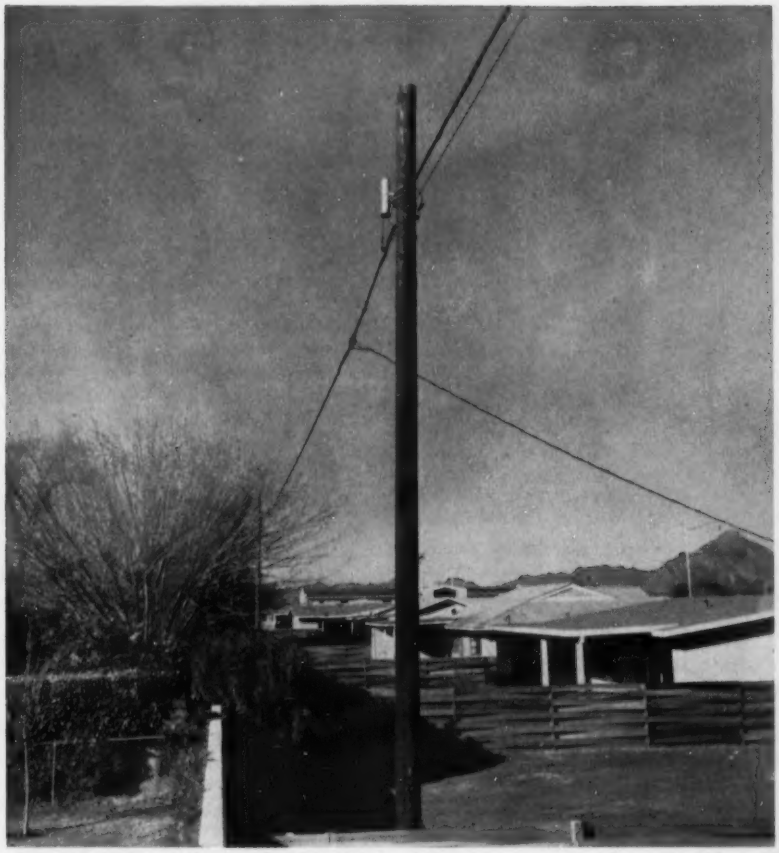
Since summer temperatures run extremely high in the central valley areas of Arizona, where 80,000 of the utility's 105,000 residential electric customers are located, refrigerated air conditioning systems have received greater acceptance for home use than in most other Western states. Figures taken from a survey made by the company in the winter of 1953 indicate that refrigeration air conditioning units (3 hp and up) have a saturation of 2% in Phoenix area homes. In Yuma, on the western border of the state, however, the figure runs as high as 11%.

Refrigerated air conditioning is fast becoming a must for complete summer comfort in the homes in central Arizona. Pioneered in the area by commercial establishments as a means of increasing summer business, air conditioning during the past few years has become very popular for home use. Actually it has been a gradual educational process on the part of the public. First, the window-box evaporative-type cooler brought low-cost comfort to a limited degree to the home. Soon it was discovered that while evaporative cooling was quite effective, it was not nearly so effective as refrigerated air conditioning. People sampled the ultimate in summer comfort each time they visited their favorite department store, beauty shop or restaurant. More and more they have been subjected to the marked contrast in comfort as provided by the two types of cooling.

This graphic demonstration of the merits of refrigerated air conditioning has been responsible to a great degree for the acceptance currently being given to this type of cooling for home use. Refrigerated air conditioning is destined to become one of the major residential loads of tomorrow and further development of the reverse cycle heat pump units, with their more desirable load factor, will offer great appeal to utility companies.

Decided on Three Phase

In arriving at our decision to supply three-phase power to serve residential air conditioning loads, all factors involved in our particular area were given very careful consideration. With



Secondary capacitors correct power factor, one rkva to two kva of transformer capacity

five years of experience behind us, we are convinced that the three-phase service policy is the right decision for the customers and the company.

Prior to 1949, the few requests for three-phase refrigerated-type air conditioning received each year were treated as individual service problems. During 1949, the increase in requests for three-phase service was very noticeable. It became apparent that this problem was with us to stay and it required considerable study on the part of our engineering, construction, operating, sales and management people.

Several problems came up with the first installations that led to establishing definite service policies. It was noted that when one air conditioner was installed, it would soon be followed by at least one more in a nearby home. Therefore, a power transformer of sufficient size to carry the load of one or two additional units was installed.

The company's engineering people decided upon the 120/240-v delta system rather than the 120/208-v wye for several reasons. This system required two larger transformers in open-wye/open-delta as against three similar transformers for the three-phase, four-wire wye system, affording economies in transformers. The 120/208-v system requires the use of 208-v motors or if 220-v motors are used, which is often the case, trouble may be experienced from low voltage with present secondary design. It would also be necessary to change all three-wire customer metering to network-type meters. Practice in open-delta banks is to connect the lighting transformer to the leading phase, resulting in a better voltage balance at the customer's service.

The company was in a favorable position to supply three-phase service without extensive primary line work for several reasons. In the urban areas the 4,160/2,400-v and the 12,460/7,200-v grounded neutral system of the previous period was constructed with the primary neutral on a crossarm with the phase wire in all single-phase areas. The secondary neutral was carried on the rack with the secondary. As the company was in the process of converting to a common neutral system, this primary neutral became available as a single-phase wire. This made it possible to supply three-phase service by the addition of a transformer to make an open-wye/open-delta three-phase bank, adding a power secondary wire to the existing secondary and reconnecting the primary neutral as a phase wire.

Three-phase primary lines were already available in some of the urban areas, as well as most of the rural areas, to serve the earlier residential air conditioning loads. Practically all the company's rural lines are three-phase lines to supply large irrigation pumps. Therefore, the addition of the power transformer and service wires makes three-phase service for the most part available.

Prior to the time residential air conditioning units became popular, the company was using rural-type construction with the single-phase primary on a pole-top pin. This type of construction did not lend itself to converting to three phase without considerable rebuilding so it was discontinued. It was found that providing primary and secondary circuits and three-phase service, even before it is requested by residential customers, is economical for several reasons. When using crossarm construction on the primary the installation of both primary wires balances the crossarms, simplifying construction. Since all of the company's new secondary construction is field-spun cable, it is far more economical to include the power leg than to add it in the future.

Present practice is to install three-phase primary consisting of at least two phase wires on primary branches and all three phase wires in the secondary on all new work where it is likely that three-phase service will be required in the future. This condition exists in about 90% of the new areas being served.

Aerial Secondary Cable

Three-phase primaries, consisting of at least two phases on branch circuits, increase the capacity of the circuit and provide for better balancing of loads. The standard field-spun secondary consists of a neutral-messenger ACSR cable with two 1/0 all-aluminum neoprene-covered wires for the lighting phases and a No. 2 all-aluminum conductor for the power load.

The open-wye transformer banks are composed of one lighting transformer and a smaller power transformer, the size of each depending on the number of customers and size of three-phase units served. Secondaries are limited to a maximum of 400 ft on each side of the transformer bank but in many cases are much less than this.

The present type of construction lends itself very well to serving three-phase loads of only a few customers per secondary section or the extreme of every service being three phase.

There are electrical devices on the market which, when connected to a single-phase circuit, will provide three-phase service for motors of the size used on refrigeration units. However, none have been used as yet because of few applications for them.

Good Distribution Economics

Our distribution engineers tell us that supplying three-phase loads in residential districts poses no great problems. Regardless of this air conditioning load, they say that it is a matter of good distribution economics to extend three-phase primary laterals well into residential districts, since with only one more primary wire twice the load of a single-phase primary can be carried. Moreover, voltage regulation is better and it is easier to balance load on the three phases on feeders and substations.

In Phoenix standard practice is to use three- and four-wire field-spun aluminum aerial secondary cable, as shown. In new tracts, a four-conductor secondary cable is installed, which makes available 120/240-v single-phase and 240-v three-phase service. In cases of a new three-phase load, where the cable is three-wire single phase, a fourth wire is simply spun on to the cable.

Flicker Voltage

Because of the much closer interaxial spacing of the conductors in these cables as compared to crossarm-mounted secondaries, there is less reactance. Although the effect is limited, this tends to reduce flicker voltage.

On the matter of flicker inherent with motor starting, it should be pointed out that the voltage drop because of line impedance on the phase legs is considerably less with three-phase service than with single phase, because of the reduced current per leg for a given size of motor.

There is, of course, the matter of power factor. The lower power factor of the standard three-phase motor as compared with a capacitor-start, capacitor-run, single-phase motor is corrected by use of secondary capacitors. Practice is to install 1 rkva of capacitance to each 2 kva of transformer capacity. The simple installation of such a 3-rkva unit is shown in an accompanying photograph.

Customers' Viewpoint

Aside from these factors, distributionwise, that favored supplying three-phase power to residential districts, there were three others that directly affected the customers in our areas. These were: (1) The immediate availability of air conditioning equipment with three-phase motors. (Prior to 1953 there were very few units available locally that were equipped with three-phase motors.); (2) Single-phase motors cost more, making the complete air conditioning unit installation more expensive and further limiting the market for home use. For instance, a 5-hp, 3-phase unit retails at approximately $150 less than the same unit with a single-phase motor; (3) The starting equipment on single-phase motors traditionally requires more service, which increases maintenance costs. When the customers are told these factors they are unquestionably in favor of the three-phase equipment and the service facilities to their homes.

This shows metering practice for air conditioning loads. All service is metered with a three-phase meter and billed on one rate

While the company's specifications for single-phase electrical installations permit it to serve motors up to 5 hp, there are relatively few such installations in its service area today. In the summer of 1953 some of the eastern manufacturers established outlets in the state through local retailers and home building contractors for air-to-air refrigeration cooling units powered by 3-hp, single-phase motors.

System Load Factor

The wide acceptance being given air conditioning by residential customers naturally creates other problems that utility management will have to face. Perhaps beyond determining whether the load will be best served by three phase or single phase, the most important problem to be reckoned with is the trend in lower system load factor that invariably results from the heavier seasonal air conditioning load.

Certainly every utility will be wise to take a realistic look at this problem. Unless a long-range view is taken and sales programming planned to bolster system load factor and offset this seasonal load, net earnings from residential customer service can conceivably dwindle to the danger point alarmingly fast.

Arizona Public Service is now undertaking a load study and doing considerable survey work to determine the best long-range sales programming to follow. Preliminary figures already reveal that residential load factor for the entire company system is 39%. Further, by projecting unit sales of all types of electric appliances for the next five years at the same rate of unit sales achieved in the territory during 1953 and taking into consideration the still greater acceptance that air conditioning will receive, it is estimated that residential load factor can conceivably drop to approximately 32% by 1958 unless definite steps are taken to prevent it.

Selective Load Building Planned

Our approach, as we view it now, is not to discourage the residential use of air conditioning but rather to put a major portion of sales and promotional efforts behind such items as clothes dryers, ranges, water heaters, food freezers, lighting, spot heating, electric blankets and other appliances that will tend to bolster system load factor and at least hold it at its present level in face of the still greater residential air conditioning load anticipated. With the help and guidance of outside service organizations the company is starting a rather comprehensive study of load characteristics of the various home appliances. Although we have no definite findings on actual annual load factor on our air conditioning load alone, our present estimate is about 8%. In this particular area, average annual residential revenue from a 5-hp air conditioning unit is approximately $150, based on 1,500 hours of operation over a five-month period. Service to residential customers with air conditioning units is measured through a single meter installation and billed on a domestic rate with demand feature.

New developments in the use of electricity in the home will further complicate the problem of providing adequate service in the years ahead. The all-electric home is inevitable—people want the comfort, convenience, enjoyment and happiness it brings to their living. It is up to utility companies to supply the electric service customers will need in a dependable, efficient manner and at a price they can afford to pay.

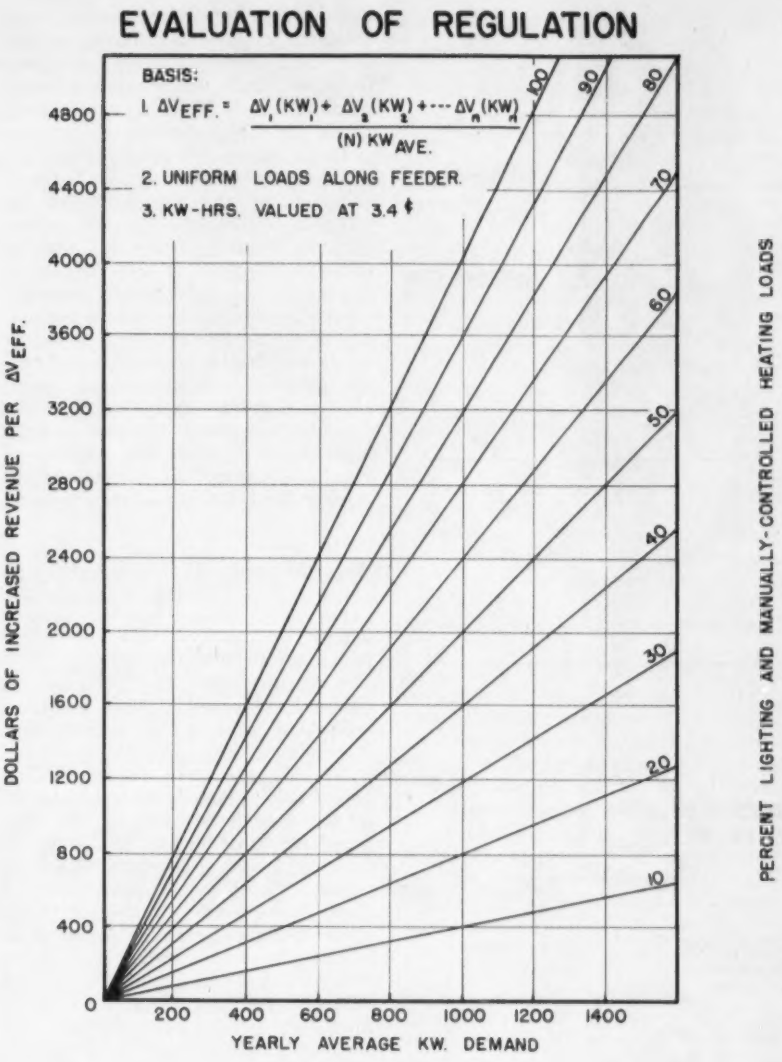


Fig. 1

Improve Regulation— Increase Revenue

Study shows economic justification for carrying automatic regulation further down to the customer. In one case an effective increase of one volt recovered $1,800 yearly lost revenue. Capitalized at 14% this would justify an expenditure of $12,800 for better voltage regulation. In another case three-volt increase would justify $20,570

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• If voltage regulation on a distribution system is less than optimum, the result will usually be loss of substantial revenues to the operating utility. The surprising factor, as revealed by a study made of the California Electric Power Co.'s distribution systems, is that the recovery of this lost revenue frequently requires only minor expenditures and effort. Since a utility operates with an extremely narrow margin between revenues and costs, a small increase in revenue, if obtained on a relatively cost-free basis, may be worth a great amount of effort.

The value of better regulation was appropriately illustrated in ELECTRICAL WEST's letter to distribution engineers, entitled "Put the $ Sign on Distribution Economics" that appeared in the November 1953 issue. In his letter, W. C. Heston expressed the need of the economic evalutions of both better regulation and reduced losses. Determination of the benefits of better regulation was the subject of a series of recent studies by engineers of the California Electric Power Co. Techniques for evaluating better voltage regulation have been determined that provide sound economic methods for justifying capital expenditures for new automatic voltage-regulating equipment and for justifying much better maintenance and engineering programs than are commonly in use.

Justifying Capital Expenditures

An all too common utility practice is that of basing the justification of capital expenditures for voltage regulators on the existence of intolerable or near-intolerable voltage conditions on a given distribution system without regard to the possible economic advantages of automatic regulation. While it is true that in cases of extremely poor voltage conditions the use of regulators becomes a necessity in order to avoid possible damage to consumer equipments and the loss of customer good will, there is a second and usually more important reason for using regulators.

Automatic voltage regulators, when properly applied to distribution circuits serving lighting and manually controlled heating loads, will realize material increases in revenue as well as providing other less tangible benefits. Power consumption of these loads varies approximately as the 1.6 power of the applied voltage. An increase in lighting kilowatt-hours and, consequently, in lighting revenue of about 1.3% will be realized with each increase of one volt in the vicinity of 120 v (nominal).

Fig. I was prepared to illustrate the method of estimating the amount of increased revenue that would be real-

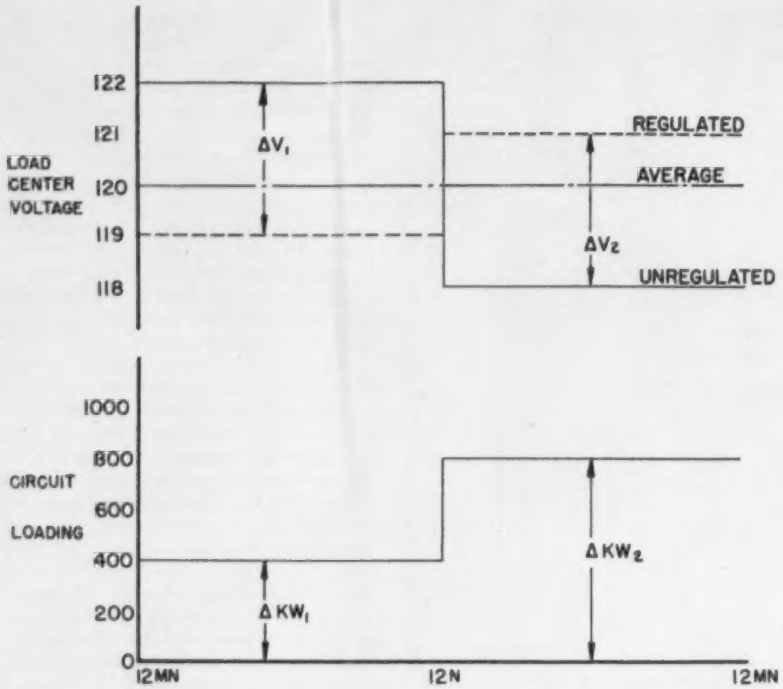


Fig. 2

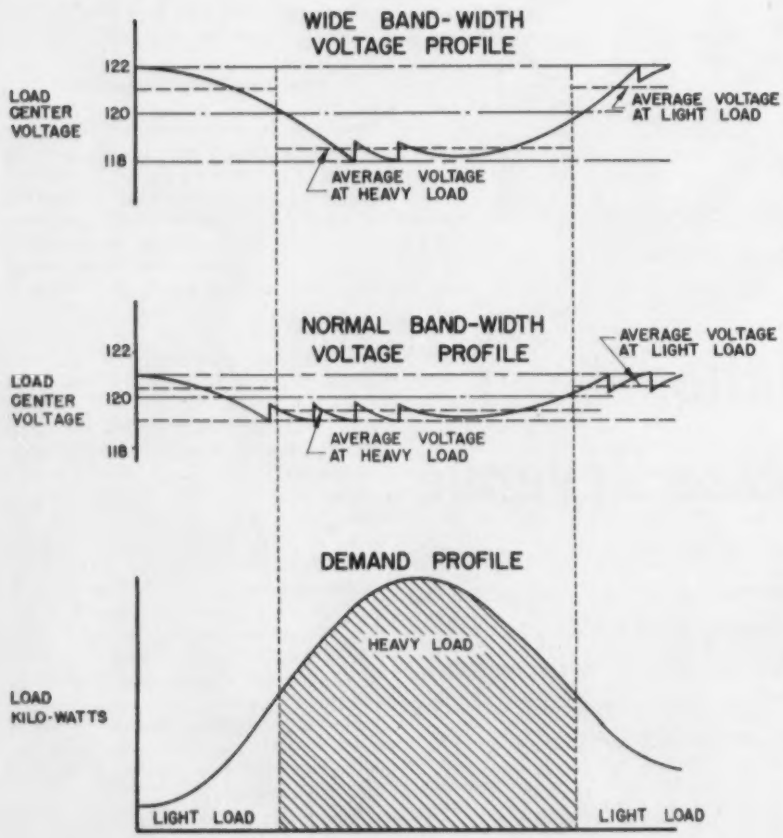


Fig. 3

ized by the addition of voltage regulators to a given distribution system or circuit. The particular figure shown is based upon the average revenue value of a kwh (3.4c) at a residential meter for a hypothetical rate zone.

In the use of this graph, two major problems are encountered: (1) determination of the magnitude of the *effective* or weighted-average voltage increase resulting from the addition of voltage regulators and (2) determination of the lighting and manually controlled heating loads as a percentage of the total circuit load. It should be noted that a regulator can raise the *effective* voltage without raising or changing the *average* voltage. The magnitude of the effective voltage boost resulting from the addition of regulators must be determined by solving the following equation:

$$\Delta V_{eff} = \frac{\Delta V_1(kw_1) - \Delta V_2(kw_2) - \ldots \Delta V_n\,(kw_n)}{N\,(kw_{ave})}$$

where

Δ denotes an increment voltage

Kw_1, kw_2, etc., are instantaneous demand values taken from a typical daily load curve at (N) uniform time intervals.

V_1, V_2, etc., are corresponding values of regulator buck or boost volts as determined by applying the proposed regulator settings to the typical load and a typical unregulated voltage curve. (These values must be used with due regard to their algebraic signs: boost volts being regarded as positive, buck as negative.)

Fig. II shows an idealized daily load curve of the block form (used for its illustrative simplicity) together with associated voltage curves. In this example, $\Delta\ kw_1 = 400$ kw, $\Delta\ kw_2 = 800$ kw, $\Delta\ V_1 = -3$ v, $\Delta\ V_2 = +3$ v, $kw_{ave} = 600$ and $N = 2$.

$$\Delta V_{eff} = \frac{(-3)\ (400) + (3)\ (800)}{2\ (600)} =$$

1 v **effective** increase

It is to be noted that although the unregulated and regulated load center voltages have identical *average* values, the regulated voltage has an *effective* value that is one volt greater.

In the event the unregulated-voltage curve indicates that the substation transformer tap setting in use is not optimum the curve should be corrected to values corresponding to the preferred tap prior to the computation of $\Delta\ V_{eff}$.

In most cases, it will be necessary to estimate the per-cent lighting and manually controlled heating loads. This particular factor is the weak point in

the use of the graph. It should be compensated for by the assumption of strongly conservative estimates based, preferably, on personal knowledge as to the type of load area served by the circuit or system in question. It is suggested that a few field measurements of load changes induced by manually controlled voltage changes may be of considerable aid in establishing a basis of judgment to be used in making the required estimates for other unregulated circuits. An accurate indicating voltmeter and a similar wattmeter would be used on typical regulated distribution circuits.

As an illustration of the possible economic value of automatic regulation applied to a typical distribution substation, the following hypothetical case has been set up and evaluated using Fig. I.

1. Load characteristics:

Peak substation demand	2,000 kw
Average substation demand	800 kw
Annual load factor	40%
Per-cent lighting and manually controlled heating factor	30%
Effective voltage increase because of automatic voltage regulation	3 v

2. Added revenue and cost data:

Added revenue per effective volt of increase, dollars per year	$ 960
Total added revenue for 3-v effective increase	2,880
Capitalized value of added revenue (capitalized at 14%)	20,570
Estimated installed cost of a 300-kva (3,000 load kva) 3-phase regulator	14,000

The rather large difference between the capitalized value of the increased revenue and the installed cost of regulation, as shown here, should not be looked upon lightly as being the expected result of a "loaded" example. The assumed load factor, per-cent lighting and manually controlled heating factor, and the value of effective voltage increase are all considered conservative as compared to the values frequently encountered in studies of this nature.

Engineering and Maintenance

It should be recognized that the recovery of revenue through the application of better regulation is dependent upon the application of sound engineering principles (in the choice of equipment, design of installation and the determination of control settings) and upon an adequate maintenance program.

In the economic example given previously it was shown that, for this hypothetical substation, a one-volt change in the effective voltage level was worth $960 per year in revenue. Certainly, with a potential gain or loss of such a magnitude at stake at a single substation, a considerable amount of study is warranted to insure that (1) the regulating equipment is appropriate to the job and (2) that the control settings are based upon accurately calculated or measured parameters rather than arbitrary or imagined values.

As a consequence, it is believed that the responsibility for regulator control settings should be restricted to a specialized engineering group. The members of this group should have a personal working knowledge of all phases of the installation and maintenance of regulators.

Regulators Need Checking

Even the best engineering, however, will not insure that regulators will continue to operate exactly as they were originally set. The provision of an adequate maintenance program is fully as important as is sound engineering. While it is quite obvious that a change or drift in the balance-voltage setting of the control equipment can adversely affect revenue or, perhaps, customer's equipment, it is also true that a change in the band width may have the same effects.

An excessively narrow band width will cause a regulator to cycle or hunt repetitively. An overly wide band width will, without a change in balance or average voltage, result in a decrease in the *effective* voltage. As is illustrated by Fig. III, during the time when the load is increasing and over the peak-load period, the regulated load-center voltage will tend to ride at or near the bottom of the voltage band. When the load is decreasing and over the light-load period, the voltage will tend to ride at or near the upper limit of the band.

Band Width

In general, an excessively narrow band width is readily detected, either through customer complaints of light flicker or through the evidence presented by the operations counters in the case of tap-changing regulators. However, an excessively wide band width will generally go unnoticed almost indefinitely unless detected by a routine maintenance check. Since an excessively wide band width, in effect, will reduce the load-center voltage at the time of the greatest connected load, a corresponding reduction in lighting and manually controlled heating kilowatt-hours sold during that same period will result, with a consequent loss of revenue. The lack of an adequate regulator maintenance program will be reflected by direct losses in revenue.

It has been the experience of the California Electric Power Co. that these revenue losses are many times greater than the cost of any reasonable maintenance routine. As a typical illustration, during a routine maintenance check of a bus regulator in a 6,000-kva distribution substation serving a 4,000-kw domestic and commercial load, the voltage sensitive control relay was found with a balance voltage one volt low and a band width that was one-half volt wider than desired. When these small discrepancies were evaluated in terms of lost revenue, the revenue loss rate was conservatively estimated at $1,800 per year at the time of the inspection.

Routine Checks Pay

At this rate the cost of the routine check, including overhead, was more than equaled by the restored revenue in the following three days of operation. Controls of this regulator had not been thoroughly checked in over a year and, although it is not possible to evaluate the lost revenue, the likelihood is that substantial losses were sustained.

The company has subsequently established a tentative schedule that calls for routine regulator control maintenance every six months in substations of 2,500 kva capacity or greater, and every year for smaller substations. It is expected that this schedule will be reviewed periodically and perhaps revised toward a more rigorous program if field experience justifies such a measure.

Further Considerations

There are practical limits to the possibility of increasing revenue through increases in voltage levels. Maximum voltages supplied to those customers nearest the regulated source must be limited to values well within the design limits of their equipments. California Electric Power uses the EEI-NEMA voltage design standards for utilization equipment as a basis for determining voltage regulator settings that will provide optimum voltage characteristics on a given system or circuit.

In general, the company has found that line-drop compensation to a point considerably beyond the theoretical load center of a distribution circuit is desirable provided, of course, that such overcompensation does not impose undesirably high voltages on the nearest customer's facilities. The normal load-center method of setting regulator line-drop compensators has been found to be far from optimum in nearly all applications encountered to date.

Teams of skiers cover snow courses of West to provide valuable annual data on runoff supplied by the Soil Conservation Service

Forecast Floods in North, Dry in South

Clyde E. Houston and **Homer J. Stockwell** Soil Conservation Service
Senior Civil Engineer Hydraulic Engineer

Prospective water supplies for western United States in 1954 vary from ample supplies and possible floods on the northern section of the Columbia Basin to an extreme water shortage on the Rio Grande in Colorado and New Mexico. This is the latest summary of water supply conditions as prepared by the U. S. Soil Conservation Service, based on observations on nearly 1,200 snow courses in the mountain areas of the West.*

This brief analysis of April 1 snow surveys, again presented by ELECTRICAL WEST, shows a wide range of runoff in prospect for irrigation, power generation and municipal and industrial use.

Water Shortage Continues — The water shortage of the Rio Grande drainage is particularly critical with a combination of low snow cover and lack of reservoir storage. This situation has developed through a series of years of deficient runoff. Although runoff will be slightly more than during other recent dry years of 1950, 1951 and 1953, total water supply will be less in New Mexico. This pattern of low prospective runoff extends to a lesser extent through to central Colorado, southeastern Utah and Arizona. Record spring storms during the latter part of March materially improved the outlook for the Salt River in Arizona. Reservoir storage was increased 250,000 acre-ft and soil moisture conditions are good. The storm did not reach the watershed of the Gila River. Previously, record low stream flows were expected.

In Utah water supply will be near average with some shortage in the Bountiful-Farmington area of north central Utah.

Nevada snow storage is very spotty. It ranges from about one-third of normal in the north to near normal in the Sierra Nevada.

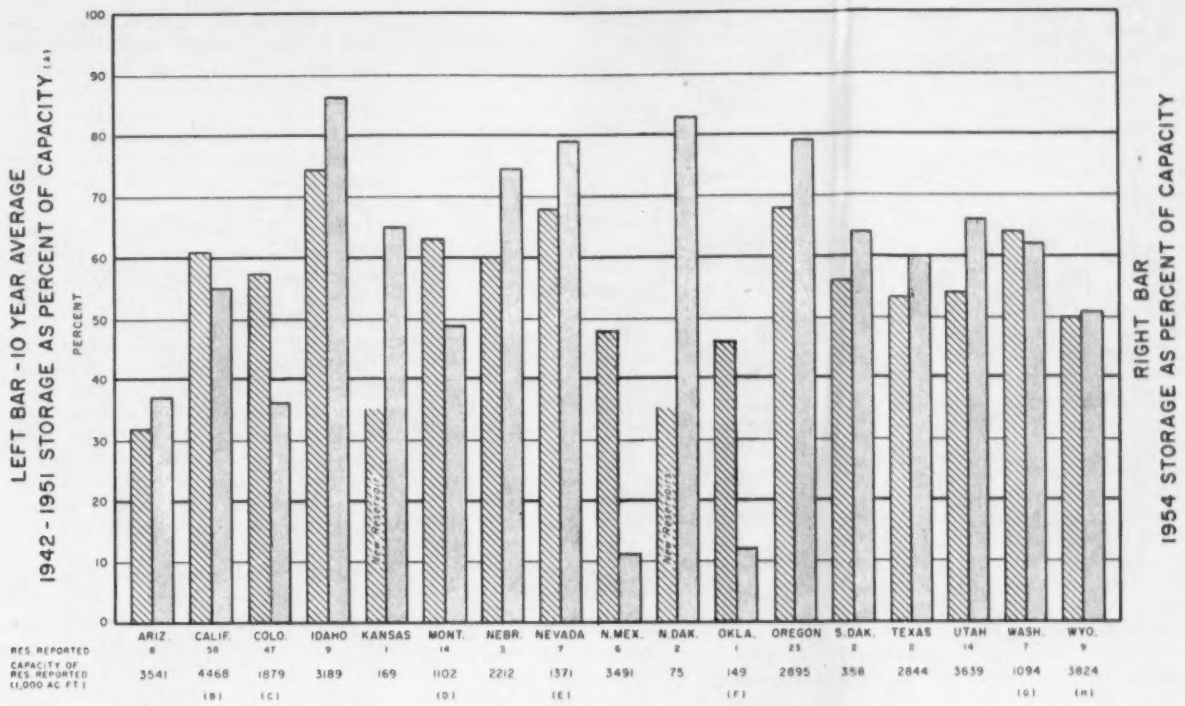
Columbia Watershed Above Normal —Snow cover on the Columbia River watershed as a whole is heavier than in 1948. However, it is only remotely possible to have recurrence of the late snow melt and spring rains of that year, which produced the record flood flows of 1948. Heaviest snowfall has been in northern Idaho, Montana and southern British Columbia and on the east slope of the Northern Cascade Mountains. Other sections of this basin, in southern Idaho, northern Nevada and southeastern Oregon, have been extremely deficient in snowfall during the winter months and summer stream flow will be short. Water supply in most of Oregon will be generally good. Seasonal snow accumulation is normal and 90% of last year.

The following forecasts of stream flow for the major rivers of the West for the April-September 1954 period will indicate general watershed conditions at the start of the runoff season. The flow of the Columbia at The Dalles, 123% of normal; Colorado near Grand Canyon, 67%; Upper Missouri River and tributaries will average about 110%; Platte River and tributaries about 65%; Rio Grande about 50%.

Storage in irrigation reservoirs is generally above the past 10-year average except in the drought areas of Colorado and New Mexico.

For the first time this year, a brief summary of water supply conditions for irrigated districts in states of the Western Great Plains is included in this report. With many of these districts the water supply outlook is de-

*The Soil Conservation Service is the federal coordinating agency of snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Forest Service, National Park Service, Geological Survey, various departments of the several Western states, irrigation districts, power companies and others. The California State Division of Water Resources conducts and coordinates snow surveys in that state, while the British Columbia Department of Lands and Forests, Water Rights Branch, has charge of the snow surveys in that province. The U. S. Weather Bureau makes West-wide Water Supply Forecasts at more than 320 gaging stations, these forecasts being estimated principally on the basis of measurement of precipitation. The Weather Bureau Forecasts are for the water year (October-September inclusive), whereas snow survey forecasts are always for the irrigation season only.


LEFT BAR - 10 YEAR AVERAGE
1942 - 1951 STORAGE AS PERCENT OF CAPACITY (a)
PERCENT
RIGHT BAR
1954 STORAGE AS PERCENT OF CAPACITY
100
90
80
70
60
50
40
30
20
10
0
New Reservoir
New Reservoir
ARIZ. CALIF. COLO. IDAHO KANSAS MONT. NEBR. NEVADA N.MEX. N.DAK. OKLA. OREGON S.DAK. TEXAS UTAH WASH. WYO.
RES. REPORTED 6 58 47 9 1 14 3 7 6 2 1 23 2 2 14 7 9
CAPACITY OF RES. REPORTED (1,000 AC. FT.) 3541 4468 (b) 1879 (c) 3189 169 1102 (d) 2212 1371 (e) 3491 75 149 (f) 2895 358 2844 3639 1094 (g) 3824 (h)

RESERVOIR STORAGE AS OF APRIL 1, 1954

Explanation: (a) Most state averages for reported reservoirs are for full 10-year period, but in a few cases reservoirs having shorter records are included; (b) Does not include Shasta, Millerton or Pine Flat reservoirs (combined capacity 6,120,500 acre-ft), April 1 combined storage 4,191,530 acre-ft; (c) Does not include John Martin reservoir (capacity 655,000 acre-ft), April 1 storage 15,600 acre-ft; (d) Does not include Fort Peck reservoir (capacity 19,000,000 acre-ft), April 1 storage 12,180,000 acre-ft, does not include Flathead Lake (capacity 1,791,000 acre-ft), April 1 storage 616,100 acre-ft, does not include Hungry Horse reservoir (capacity 3,500,000 acre-ft), April 1 storage 1,947,000 acre-ft; (e) Does not include Lake Mead (capacity 27,217,000 acre-ft), April 1 storage 15,701,000 acre-ft; (f) New reservoir in 1945; (g) Does not include Roosevelt Lake (capacity 5,172,000 acre-ft), April 1 storage 2,933,000 acre-ft; (h) Does not include Boysen reservoir (capacity 758,000 acre-ft), April 1 storage 382,100 acre-ft.

pendent on current storage in reservoirs in relation to expected water demand rather than water stored as snow.

In the following paragraphs the water supply situation is briefly outlined for each state. Charts indicating current status of reservoir storage and a map showing approximate runoff summarizes the outlook for the coming season.

Arizona—Water prospects on the Salt-Verde system are fairly good but the outlook for the Gila-Frisco is poor. Moisture from the storm of March 22-24 did not reach into the Gila drainage sufficiently to make up the existing deficiency. This storm was a record for this time of year, exceeding all late storms back to 1905, and resulted in a more optimistic outlook for water on the Salt-Verde area. Prior to the storm all streams were expected to establish record low flows that would probably not have been equaled for many years. Present outlook, entirely due to this storm, is for median conditions on these watersheds.

The Gila area, particularly the San Carlos project west of Florence, still faces an extreme shortage of water. The 40,000 acre-ft of water produced by this storm, and perhaps 10,000 additional that can be anticipated, will not serve to carry the project for long. There are 100,000 acres within the project. The balance of water needed will have to come from pumps located in the already over-developed ground water basin in central Pinal County.

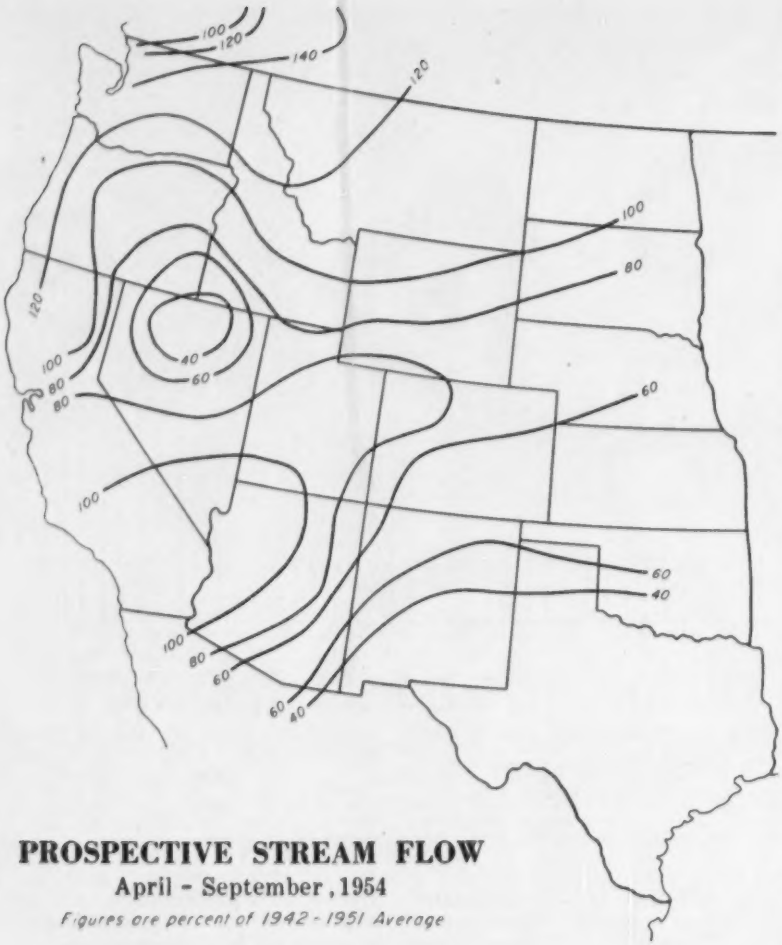
British Columbia—According to the Water Rights Branch of Provincial Department of Lands and Forests, most snow courses in the Columbia, Kootenay, Similkameen and Skagit Basin in British Columbia have snow water contents that are by far the heaviest ever recorded for this time of year. Observers in these areas report no sign of thawing, little runoff and continued cool weather. The results of their measurements reveal that a deep snow pack of low density exists, which indicates that the snow has not begun to ripen in preparation for the spring thaw. The soil mantle under the snow is generally reported as unfrozen but is damp and well primed with moisture.

The April to September runoffs in these areas are predicted to be from 30% to 50% above the 10-year normal and, if they actually occur, will result in most cases with the largest runoff on record. Consequently a serious flood potential now exists and a gradual well-ordered snow melt will be necessary to avoid peak discharges of damaging proportions.

Snow packs in Okanagan Basin, however, are near normal and an inflow to Okanagan Lake is expected to be about 15% below normal. This area can anticipate good water supplies from snow melt.

California—The California Division of Water Resources reported that the water supply in California will be near or above normal north of the latitude of Oroville, slightly below normal in the remainder of the Central Valley and southern Lahontan areas and considerably below normal in the Santa Clara Valley and central coastal and south coastal areas, providing normal precipitation occurs during the remainder of the season.

The snow pack averages slightly less than one year ago in the Cascade Mountains and the Northern Sierra Nevada and is greater than one year ago on the watersheds south of the Stanislaus River. The water content determined by snow course measurements varies from 80% of normal on the Yuba, American and Mokelumne River watersheds to an average of about 105% of normal on the Upper Sacramento and Tule River watersheds. Normal or above normal snow



PROSPECTIVE STREAM FLOW

April - September, 1954

Figures are percent of 1942 - 1951 Average

melt runoff is expected in streams of the north coastal area and in the upper Sacramento River in the Central Valley area. In the remainder of the Central Valley area, snow melt runoff may be expected to vary between 92 and 72% of the 50-year normal in the Feather and the American Rivers respectively.

Storage in California reesrvoirs utilized for conservation is above normal for April 1 except in the south coastal area. With normal conditions, such reservoirs on streams tributary to the Central Valley area may be expected to fill during the snow-melt period.

Runoff during the six-month period ending March 31, 1954, has been below normal on streams other than those in the northern part of the north coastal area and on the Upper Sacramento and Napa Rivers.

Predicated on estimated recharge and average conditions of draft, groundwater levels throughout the state in the fall of 1954 will in general be lower than those of 1953. Measurements made during March indicate that lowering in groundwater levels is generally prevalent in the important groundwater basins. Rises in groundwater levels were reported from a few locations in the San Francisco Bay, south coastal, and Central Valley areas, and generally over the central coastal areas.

Colorado—Summer discharge of all streams originating in the mountains of Colorado will be less than normal in 1954. Precipitation at high elevations was extremely deficient during the fall months. Seasonal snow accumulation has been below normal. Snow water content on high elevation courses ranged from 70% of normal to near normal as of April 1. All medium and low elevation courses were less than 75% of normal. Summer runoff on the Rio Grande, Colorado and Arkansas Rivers and their major tributaries is expected to be in the range of 60 to 70% of normal. Some South Platte tributaries, the North Platte and Laramie Rivers will have slightly higher summer runoff.

Soil moisture conditions in irrigated areas are fair to poor east of the Continental Divide and fair to good on the west slope of Colorado. Storage in irrigation reservoirs is substantially below a year ago and is below the past 10-year average. Water shortage may be expected in all areas except where there is a considerable amount of supplemental water available as in the Northern Colorado Conservancy District. Most critical shortages are expected on the lower Arkansas and on the Rio Grande.

Idaho—Northern Idaho rivers have a record snow pack with excellent water supplies forecast for 1954. Serious flood potentials exist on the Kootenai, Clearwater, Spokane and Pend Oreille Rivers. The most vulnerable flood plains are along the Kootenai River which has the greatest snow pack ever recorded since snow surveys began on the watershed in 1937. With normal spring conditions this river is expected to peak at 100,000 cfs as measured near Leonia, Idaho. Serious flood damage can result when the river goes over 90,000 cfs.

In southern Idaho prospective water supplies are poor as a result of a light snow pack. Prospects for the southern tributaries to the Snake River vary from 22 to 41% below normal.

Kansas—Water supply outlook for irrigated areas along the Arkansas River is poor as of this date. Irrigation in this area depends on a small part of the normal flow of the river, return flow from irrigation in Colorado and storage in John Martin reservoir. Inflow to John Martin reservoir probably will be less than one-half of average unless there are extremely heavy storms on the plains of eastern Colorado during the spring and summer. The reservoir is now nearly empty and storage is only a fraction of normal.

Soil moisture conditions in the Arkansas Valley in western Kansas are fair.

Storage in Cedar Bluffs reservoir on the Smoky Hill River, serving an irrigated area near Ellis and Hays, is 110,000 acre-ft or 65% of capacity. Since the irrigation works have not been completely developed this is more than adequate for irrigation needs.

Montana—The 1954 snow pack over the Columbia River Basin in Montana is exceptionally heavy this season. The Kootenai River Basin has a record snow pack and a flood potential exists. On the Flathead Basin the snow pack is 20% greater than in 1953. The South Fork of the Flathead should flow 2,710,000 acre-ft of water from April through September, or 120% average. The Flathead at Polson should reach 8,747,000 acre-ft for the April-September period or 125% average. The Clark Fork River above Missoula is short of snow cover this season and is expected to flow 90% average. The Bitterroot River has a fair snow pack and is anticipated to

flow 107% average this season.

The Upper Missouri Basin in Montana has an average snow cover except for the Marias, Teton and Sun Rivers. These streams reflect the Columbia Basin conditions with a snow pack much higher than last season and 174, 163, and 132% of the 6- to 15-year average respectively. A flood potential on these streams could be realized under adverse precipitation and temperature conditions early in the runoff season.

The Yellowstone River Basin through Montana has approximately a 115% average snow pack, which should produce a fair water supply from April through September. The Clark Fork of the Yellowstone has below normal snow cover and is expected to flow approximately 82% average from April through September.

Nebraska — Storage in Nebraska reservoirs is above normal. However, in the western area of the state, along the North Platte, this year's water supply is stored in Wyoming or is in prospective stream flow from Colorado and Wyoming. The combination of storage and expected inflow into North Platt reservoirs should be adequate on the North Platte project for an average irrigation water demand. Current storage will provide sufficient water for the central Nebraska irrigated district and for the limited irrigation development along the Republican River.

Soil moisture conditions are fair in Nebraska and stream flow is now slightly below normal.

Nevada — The state's outlook for 1954 water supplies from snow melt is spotty. Snow stored water throughout the state ranges from very poor in the north to fair in the central section and excellent in the southern section. Along the Humboldt tributaries, streams can be expected to flow from 40 to 80% normal while the main stem will flow about 50% normal. Runoff into Nevada from the east central Sierra will range from 75% in the north to 85% normal in the south.

Users of snow fed streams in the southern desert section of the state can expect as high as 150% normal flow. October through March stream flow at key stations on the Humboldt and eastern Sierra was 90 and 100% normal respectively. In general, groundwater levels are below normal.

April 1 reservoir storage in seven important reservoirs was 79% of capacity and 115% of the past 10-year average.

New Mexico — Water supply outlook for New Mexico is possibly the worst in recent years. Stream flow is expected to be slightly higher in the Rio Grande than for the years 1950, 1951 and 1953. However, storage in irrigation reservoirs is extremely low. Total reservoir storage and expected stream flow combined will equal less than one-half of the normal irrigation water demand. Pumping will be used to help alleviate the shortage in the Mesilla Valley.

Precipitation in valley areas has been negligible and soils are extremely dry. Similar conditions exist along the Pecos except that reservoir storage is slightly better than for the Rio Grande. Soils in the Carlsbad and Roswell districts are extremely dry.

North Dakota — The high plains state of North Dakota did not receive a snow cover of any great extent this season. The ground for the most part was not frozen and what snow did fall melted into the soil without causing flood damage. Soil conditions are relatively dry and spring rains will be necessary to assure sufficient moisture for crop growth.

Oklahoma—The Lugert-Altus irrigation project in Oklahoma has a very limited water supply. Storage in W. C. Austin reservoir is about 17,000 acre-ft, which is 25% of average and 12% of capacity. This reservoir is entirely dependent on flood runoff. Storage has been gradually declining for three years. Precipitation has been deficient for several months. Soils in the irrigated area are dry.

Oregon—Water supply outlook for 1954 in Oregon is fair to excellent. Near average stream flow is expected except in the far eastern portion of the state. Water supplies will be adequate in western Oregon and in all areas where storage water is available. Some eastern Oregon lands will have late season shortages unless adequate May-June rains are received.

Water content of mountain snow cover averages 102% of normal based on 106 long record snow courses and is 89% of last year. Reservoired water in 23 reporting reservoirs is 116% of average. Mountain soils are well wetted except in the extreme eastern part of the state.

South Dakota — Available records of reservoir storage in South Dakota show less than normal reservoir storage. However, the snow cover is apparently well above normal in the Black Hills, indicating a normal yield for this watershed.

Texas—Irrigation water will be extremely short in the El Paso area of west Texas, which depends primarily on storage in Elephant Butte reservoir. This area has been short of water for several years and this year there probably will be less total water available from the Rio Grande than for any year of record.

Slightly better conditions exist for the Pecos River in Texas but water supply there also will be short. Pump irrigated areas in northwest Texas have extremely dry soils due to drought conditions of the past several months.

On the Colorado River of Texas, storage is well above the past 10-year average in Mansfield and Buchanan reservoirs.

Utah—There are two small areas in the state which have very poor runoff prospects. The Farmington-Bountiful area of the Central Wasatch Front in northern Utah has the poorest snow cover since the drought year of 1934. In southern Utah on the East Fork Sevier River-Escalante River, in spite of the heavy snow accumulation of March, snow cover is still only 50% of average, although about one-third more than last year. Elsewhere in the state, runoff prospects vary from 60 to 134% of average.

Water users having river storage rights will in general have sufficient water for their needs during the coming summer. Water users having only natural flow rights in those sections of the state other than southwestern Utah and the Uinta Basin can anticipate below average late season water supplies, unless a very cold, wet spring develops.

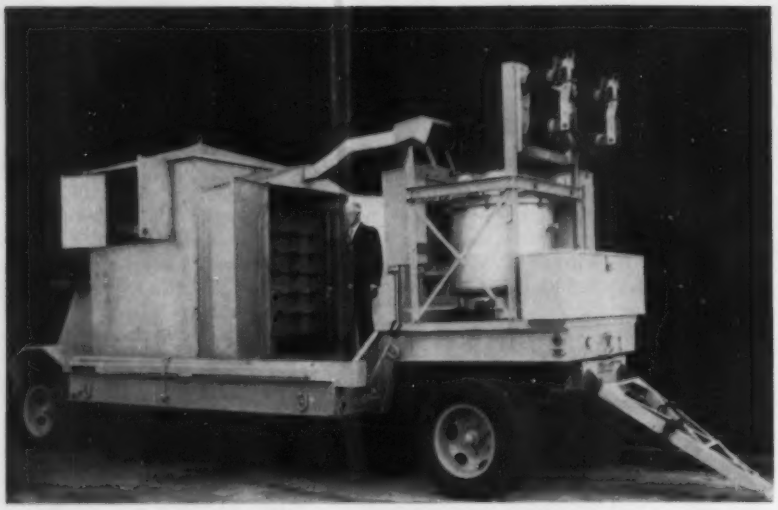
Holdover storage in 14 reporting reservoirs is 66% of capacity. This compares with 54% of capacity for the period 1942-1951.

Washington — Chelan River in Washington has the greatest snow pack measured in the 24 years that the snow course network has been in operation. This snow pack is 62% above normal. Other rivers in Washington also have a very heavy snow pack and water supply prospects are excellent throughout the state.

A flood potential exists on the main stem of the Columbia River as measured near The Dalles, Ore. This major river also has a record snow pack that is expected to produce an unregulated peak of 760,000 cfs. Unusually heavy spring rains and a late snow melt could raise this peak to a serious magnitude.

Wyoming—Snow cover throughout the state ranges from above normal in the Snake River Basin, Wind River Basin, Big Horn and Yellowstone Park watersheds to 80% of normal in the North Platte, Laramie River and Pole Mountain drainage areas. This is the second year in succession that the southern part of the state has experienced a subnormal snow pack and the seriousness is now increased by the reduced storage in the North Platte and Laramie River reservoirs.

Above normal temperatures indicate an increase, from winter melt, in the soil storage of late last fall. However, a soil deficit remains over most of the state and this will reduce the snow melt runoff indicated by the snow surveys.



California Institute of Technology now has a 200,000-amp mobile testing transformer

Extra High Current Tests Now Possible

F. H. Cole
Cole Electric

E. K. Sadler
Kelman Electric & Mfg.

Royal W. Sorensen
Cal Tech

A 200,000-amp, 29,000-kva mobile testing transformer is now available to utilities of southern California through sponsorship of the Cole Electric Co. of Culver City, Kelman Electric & Mfg. Co. of Los Angeles and Royal W. Sorensen, California Institute of Technology, Pasadena. The equipment makes available to the electrical industry of southern California means for studying high-current problems. For the engineering staff at Cal Tech it provides facilities for extending studies relating to the performance of high-current density contacts that were made during the development of the vacuum switch and for other high-current problems. Cole Electric, Kelman and some utilities of southern California had expressed a desire to have a test stand of this type that could be used at power system stations.

Construction is basically that of any shell-type power transformer but the design includes a number of unusual features, some of which were desirable for economic reasons. The core and framework are parts from some available outmoded transformers. Major features of the design, however, were determined by the particular use parameters. The trailer mounting was prescribed by the fact that the power supply at the college 1,000,000-v laboratory is limited to only a fraction of the desired full transformer capacity.

Design criteria were:

1. 200,000 amp at 60 cycles for load periods not exceeding five seconds.
2. Primary voltage rating 16,500 v with coils arranged for connections to provide full capacity operation at any one of several available lower voltages.
3. A secondary voltage not less than 115 v at full rated 200,000 amp.
4. Convenient mobility so it may be used at the Cal Tech high-voltage laboratory and as desired at other Cal Tech laboratories or at other locations where the transformer may be supplied with its full rated kva.

The shell-type structure was chosen because:

1. Such a transformer could be built using the core iron from some amortized 5,000-kva shell-type transformers which, after about 40 years service, were being replaced by units of recent design. Low core loss iron is not necessary in a transformer for short-time loading. When the design was made and construction started, new magnetic core material was not only costly but also was considered critical material that could be obtained only on allotment.
2. The short-time load periods and the permissable long cooling-off time between tests makes ducts between coils unnecessary. This fact permits a solid-pack coil assembly of great mechanical strength to be enclosed by a shell-type core that clamps the entire coil assembly in a bank of surrounding iron. Increased strength was added to the normal core rigidity by special iron bands around the core and insulated therefrom. With this arrangement the magnetic field forces due to the 400,000-amp turns developed by each of the primary and secondary windings cannot force the coils out of shape.

Voltages Obtainable

The primary winding has six coil groups that can be connected all series—3 series 2 parallel, 2 series 3 parallel, or all six groups in multiple. With reasonable flux density, full rating at the following voltages may be considered normal: 18,000, 16,500, 9,000, 8,250, 6,000, 5,500.

The low-voltage coils probably will seldom be connected other than with all seven coils in parallel at which time the rated current is 200,000 amp and the rated open-circuit voltage is 145. These coils may, however, be connected all in series for a load requiring about 1,000 v. Or the center coil may be idle and the six other coils connected 3 series 2 multiple, or 2 series 3 multiple. The kva rating for the latter connections will of course then be six/sevenths of normal rating. An eight-coil low-voltage winding would have provided full capacity at all secondary voltages but was not used in the interest of reducing reactance and keeping the insulation between high-tension and low-tension coils at the desired amount.

Coil Design

The primary winding has 12 back-turn section coils arranged in six groups of two coils each. The back-turn arrangement made possible a construction without taps on coils and with all coil terminals exposed for convenient access. The coils of each group are permanently joined as a unit but the six groups may be arranged with all possible connections from all series to all parallels. These coils and also the low-voltage coils are of equal height in the core window to avoid any displacement tendency such as occurs when the magnetic leakage paths around the coils are not in

balance. Each turn of the high-voltage winding is made up of five copper conductors, three of which are glass covered, thus keeping to a minimum copper eddy current losses.

The seven low-voltage coils are also back-turn section coils with one turn per section, there being two turns in each coil. Each of these back-turn coils forms a group with each of the six primary groups arranged between two secondary groups.

The plan of having two turns per coil was chosen because with a reasonable total core flux a two-turn winding produces the desired voltage. The use of back-turn coils made possible an arrangement whereby the 53 conductors in parallel making up each turn could be so connected that all 53 conductors are of equal length, a requirement for even current distribution throughout each coil. Twenty-seven of the 53 conductors making up each turn are covered with glass insulation and 26 are bare so each conductor is insulated from the others.

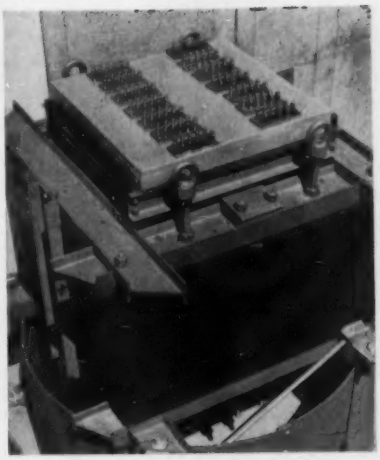
Development of a plan for winding a single-turn coil of 53 large rectangular wires required considerable study. The result was a decision to use a longer winding form than required for a proper coil dimension and to wind the conductors on it as though each coil section were to have a large number of turns, each turn made up of only a few conductors.

The coil sections were then cut and the exposed ends brought up to form an open-end U-shape coil with 53 strands at each end. The two sections of each coil were then joined so each strand of one section was brazed to a strand of the other section in such a way as to make the outside conductor of one section continue as the inside conductor of the other section and so on, as illustrated.

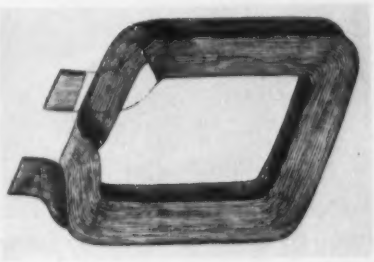
In this manner, all conductors are exactly the same length, i.e., twice the mean-turn length of each coil section. This insures as nearly as possible the same current in each wire. An even current distribution throughout the coils is a very necessary feature in coils each of which must carry 28,600 amp.

Great care must be taken with a 200,000-amp circuit to have connection terminals that will not cause a large voltage loss. Hence, each low-voltage coil end has a copper block terminal to which all strands of the coil were brazed. Each block terminal has on it 16 studs as shown, to which can be connected cables or buses as desired by making use of special slip-over sockets (illustrated).

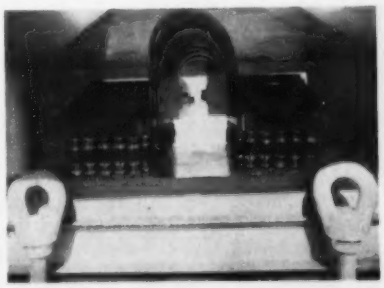
Each socket has seven sections held to cylindrical form by garter-spring bands. This arrangement provides on each stud seven line contacts. All contact surfaces are silver plated to reduce terminal contact resistance to a very low value. A standard test arrangement provides for two 300-lb bus bars. Each one of these is attached to the seven coil ends of the same polarity by 16 sockets, thus placing the seven high-current coils in parallel.



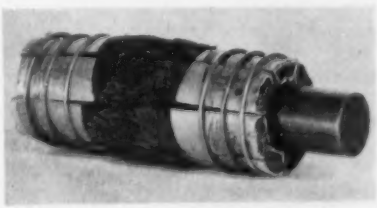
Terminal studs for 145-v coils are cast in plaster top. This holds terminals and protects the windings against falling particles



Sketch showing plan devised so that all 53 coil wires would be of exactly same length



Here is shown the seven 145-v coils connected in parallel to terminal buses and short circuited for making impedance test



A preproduction prototype of the coupling connectors shown in the photograph above

The trailer carries a complete test stand that includes, in addition to the transformer that is housed in an aluminum weatherproof housing, the primary circuit-breaker and disconnect switches for connecting the test stand to any selected power supply source. The only enclosure for the transformer is the aluminum housing. No moisture trouble is expected because much class A insulation was used and the transformer coils are thoroughly impregnated with insulation varnish. A resistance heater for keeping the transformer dry when not in use is provided. The equipment includes an automatic thermostat temperature control system.

The circuit breaker is a standard Kelman breaker, normally rated 1,200 amp with high interrupting capacity. It is provided with two calibrated bushing-type current transformers, one rated 1,200 amp and the other 2,000 amp. The breaker is equipped with automatic control tripping relays and timers so that the transformer cannot be made to carry a load of too high current or remain in circuit on any load long enough to be damaged by over-temperature.

The high-voltage coil terminals are brought out at the bottom of the transformer and may be connected to a plug board for convenient connection changes. When all coils are used in series only the full winding end leads are brought to the board, the series coil connection being made right at the coil ends, thus reducing resistance and reactance to a minimum.

The low-voltage high-current coil terminals are directly on top of the transformer and so arranged that equipment to be tested can be readily mounted near the terminals at either side of the trailer. For convenience of access to this position the equipment includes easily assembled walks, ladders, etc., and suitable mountings for their attachment. It also includes a hoist arrangement that can be set up over the transformer to use in handling the bus bars and parts to be tested.

Having the low-voltage terminals at the top of the transformer permits the use of a minimum circuit loop when testing circuit-breaker and disconnect switches. To avoid the hazard of having any foreign material dropped into the winding of the transformer, the

top is covered with a solid layer of Scotch Cast. This also aids in keeping moisture out of the windings, provides added coil-end bracing and adds strength to the coil-end insulation.

The transformer weighs about 16,000 lb, 11,000 lb of which are core iron. The circuit breaker weighs 4,000 lb. Other equipment of the trailer weighs about 3,500 lb. Thus, the total weight on the trailer is about 23,500 lb. This is well within the 35,000-lb trailer rating. The transformer has special bracing to protect it from shock damage during transportation from place to place.

Dimensions

Trailer bed length 22 ft, 3 in.
Trailer bed width 8 ft.
Over-all height above road surface 11 ft, 4 in.

Electrical Characteristics

Impedance at 29,000 kva base 13%.
Core loss 11 kw.
Copper loss at full rated kva 1,400 kw.

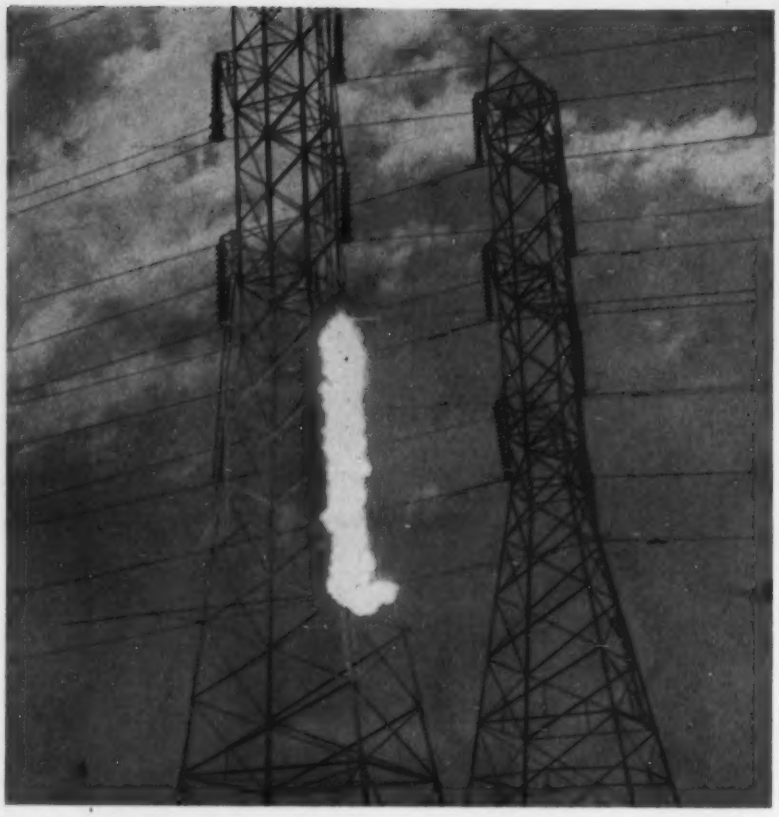
Operation Procedure

Test samples may be mounted with equal convenience at either side of the trailer. The high-current winding terminals being at the top of the transformer permit a minimum length of cable to be used for testing high-voltage circuit breakers.

Disconnect switches mounted ahead of the breaker at the front of the trailer provide a ready means of connecting the line side of the oil circuit breaker to a power supply. The breaker is provided with safety and control devices. At present the secondary transformer current is determined by measuring the primary current and computing from it the secondary current. This plan will not introduce much error in determining secondary current because of the true load current ratio transformer characteristic and the small transformer exciting current to be considered.

Convenient access to the high-current terminals is provided by doors in the sides of the aluminum housing that may be opened. Also, when desired, the doors, top and other parts of the housing may be removed. Indeed, the entire housing may readily be lifted off the base by two men, thus leaving the entire transformer accessible when tests to be made indicate such adjustments desirable.

The authors wish to acknowledge the valuable aid to the project given by the Larsen-Hogue Electric Co. for an excellent coil-winding job and to Ralph S. Thacker who designed the high-current coil terminals.



Deliberate 220-kv fault is accurately located by the hot-line monitor on parallel line

Faults Again Located to Exact Tower

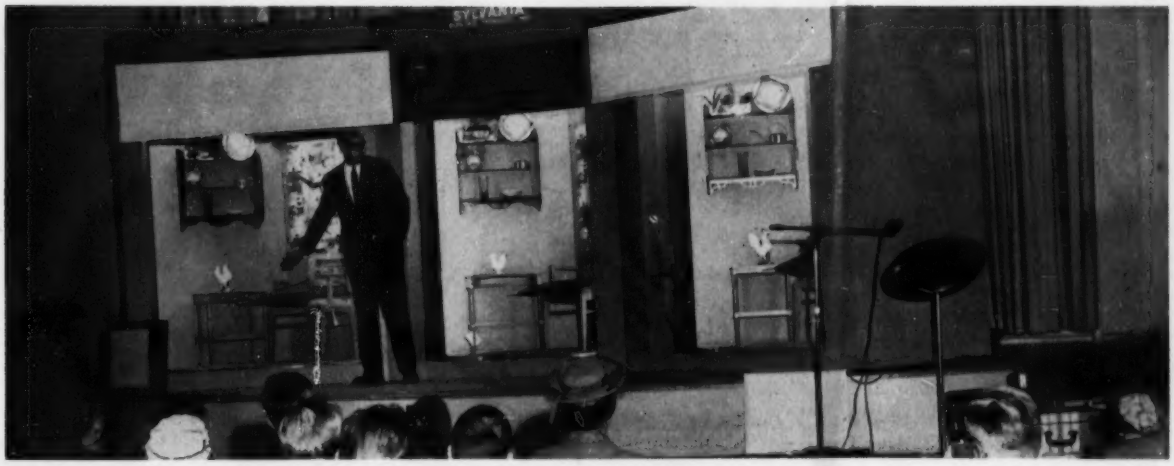
A second series of tests was successfully completed March 28 on the Risco continuous transmission line monitor and fault locator described in ELECTRICAL WEST for March, p 70. This time the tests were made on the 220-kv, 142-mile, double-circuit Pit River lines of Pacific Gas and Electric Co. The intentional ground faults, made about 54 miles from one end of the line, were located to the exact tower in two out of three shots. The other test missed the fault by half a microsecond, or less than 500 ft.

This trial was considered an acid test for the fault locator. The line involved was not only a long 220-kv circuit but the conductor is rope-lay copper with very high corona loss. Besides, and very importantly, the fault locator was not connected to the faulted line but to the similar 220-kv circuit on the opposite side of the twin-circuit tower.

Thus the tests proved two things: first, that the equipment will successfully monitor long high-voltage lines and, second, that only one piece of equipment is needed to monitor parallel lines. Contrasted to conditions in this second test, the first test was made on only a 23-mile, 115-kv line of the Los Angeles Department of Water & Power.

At the time of this latest series of tests the Pit lines were operating normally, connected to the system, and carrying a Sunday morning load of about 120,000 kw per circuit. PG and E took advantage of the tests to check relay and circuit-breaker operation.

The 220-kv breakers at Vaca-Dixon and Cottonwood substations, the two ends of the line, are of nominal five-cycle clearing time rating. Oscillograms showed that the breakers cleared well within the five-cycle time and that power was off the line (dead time) for 22 cycles. Breakers operate on an open-close cycle with conventional 30-cycle reclosing. Current at the intentional faults was approximately 2,600 amp. There was no system disturbance—even the lights at Vaca-Dixon, only 54 miles from the faults, were not noted to have dipped. The accompanying photograph shows the spectacular 220-kv arc.



With three revolving stages Don Caverly shows what different "whites" do to identical furnishings, men's, women's wear color appearance

West Meets in Three IES Regionals

Opinions and points of view vary with the individual, in lighting particularly, an over-all appraisal of the three regional conferences of the Illuminating Engineering Society in the West would indicate. Timed with a tour of the national president, A. H. Manwaring of Philadelphia, the Intermountain Region met in Denver April 15-16; the South Pacific Coast Region at San Francisco April 19-20; and the Pacific Northwest at Seattle April 22-24.

With Manwaring, several of the profession's great luminaries attended and participated. Samuel Hibben, retired Westinghouse lighting leader, addressed all three. E. W. Commery, General Electric Lamp Division, addressed the Denver and San Francisco meetings; Alston Rodgers, General Electric Lighting Institute, the San Francisco; Wentworth Potter, also from G-E, the Seattle meeting. Don Caverly spoke at San Francisco and Willard Allphin, also of Sylvania, the Denver and Seattle meetings. Marshall Waterman, Westinghouse, was on the San Francisco and Seattle programs. David Baldwin, National Safety Council, addressed all three. Leonard Hobbs, South Pacific Coast regional vice-president, also was on the Seattle program.

Differences in program were also interesting. The San Francisco meeting, held in the Museum of Art, was coordinated with an exhibit of light and color, whose central feature was the "Celestial Room." This was a model living and dining room area with garden, designed and furnished by W. & J. Sloan under the direction of Arthur Elrod, decorator, the lighting design of which was made by E. W. Commery of General Electric Co. Equipped with a dimmer control board, a great variety of lighting patterns and decorative effects was achieved.

In Seattle the pattern of the conference was well planned as the separate story in succeeding pages brings out.

For the Intermountain Region, it was the first conference since the region's formation. Full report of the conference has not been received at press time. The program, however, gives an indication of the subjects covered and speakers and points of view involved.

E. W. Commery with color comparison chart

Intermountain Conference

Three technical sessions followed by field trips comprised the Denver program, chairmanned by Harold T. Rankin, Public Service Co. of Colorado and former regional vice-president. Local engineers participated and gave many presentations. A. F. Weers, Weers Electrical Planning Service and chairman of the Rocky Mountain Chapter, spoke on "Lighting in Three Dimensions." "Quantity in Lighting" was handled by Edward S. Goldman, Central Electric Supply Co.; "Quality in Lighting" by A. D. Swanson, Swanson-Rink & Associates. G. B. Buck II, General Electric Co., Lamp Division, and regional vice-president, presented "Color in Lighting." President Manwaring spoke at the joint luncheon with the Colorado Engineering Council. His subject was "Architecture and Engineering in Lighting Design."

The second technical session was devoted to street and industrial lighting. There was a paper on "Mine, Railway and Storage Yard Lighting." Homer Shaw of Utah Power & Light Co. gave a paper on "Street Lighting." David M. Baldwin presented data on "Street Lighting and Night Traffic Accidents." Stacy Standley Jr., Line Material Co., Milwaukee, described the "Uni-Ballast System in Street Lighting." A discussion period on Denver

street lighting followed with Charles O. Woodworth and Lester J. Weber of PS of Colorado on the panel. "Problems in Lighting a Steel Mill" was handled by C. D. Hall, Southern Colorado Power Co., Pueblo.

At the third technical session Willard Allphin, Sylvania, Salem, Mass., spoke on "3-D Photography in Lighting Sales." "Light and Color in the Home" was discussed by E. W. Commery. "Class Room Lighting" was the topic of Paul Atchison, architect, Denver. Samuel Hibben, as chairman of the Diamond Jubilee task committee, IES, addressed the luncheon on the subject "Light's Diamond Jubilee—What More Can Light Do?" Separate sessions were under the chairmanship of the four chapters in the region: Carl Balsick, Pueblo Electric Supply Co., chairman, Southern Colorado Chapter; Carl Albach, New Mexico Chapter, Albuquerque; T. Dale Brown, Utah Chapter; and S. L. Burnham, Arizona Chapter, Phoenix. General conference chairman was Harold F. Rankin and F. Bishofberger was vice-chairman. Glen P. Gaer was chairman of the program committee.

Color at San Francisco

The highly practical approach to lighting predominated the San Francisco South Pacific Coast Regional Conference at the San Francisco Museum of Art. It was held with the Northern California Chapter AIA as a co-sponsor and with the cooperation of the San Francisco Museum of Art. Indeed, Dr. Grace McCann Morley, its director, opened the conference with a discussion of lighting as an art form.

Color is what brought out the differences in points of view, expressed both by speakers and from the floor. That the color problem with fluorescent sources is still far from solved was the impression an observer could not help obtain. Each speaker did his level best to simplify and clarify it. Marshall Waterman, assistant manager, commercial engineering, Westinghouse Lamp Division, Bloomfield, touched on it in discussing "The Fluorescent Lamp in Lighting Design." Alston Rodgers, chief illuminating engineer, General Electric Lighting Institute, Cleveland, presented the place of "The Incandescent Lamp in Lighting Design," and introduced new tools for the production of color. Then the theory of color was well covered by Walter Granville, color consultant, Container Corp. of America, Chicago, when he illustrated and discussed the Munsell, Ostwald and the ICI color systems. Even he summed up by saying that the color systems were an excellent working tool for the selection and coordination of color but the art of using it still was a matter of development of the individual's taste and preference.

A practical application of lamps to color was presented by Don P. Caverly, manager national accounts, Sylvania Electric Products, New York. He had an elaborate three-section display window effect in which, with revolving stages, he presented identical home furnishings, men's clothing and women's clothing (and models), lighting each with a different combination of fluorescent lamps to illustrate the effect of the light source upon the color rendition. In two other sessions color came up again. E. W. Commery, executive engineer, General Electric Lighting Institute, Cleveland, digressed from his talk, "Light and Color in the Home," to discuss the acceptable compromise that the lamp makers had had to make between efficiency and full rendition of color. He maintained that the standardization on the four whites, known as standard warm, standard cool, de luxe warm and de luxe cool, would bring clarity out of confusion and a light source for the home that could be lived with.

That every part of a store requires all of the colors in the light source in order to bring out the qualities of the merchandise was demonstrated and explained by Dave G. Parker, Haluk Lighting Co., San Francisco, in the store lighting session. This requires a mixing of fluorescent and incandescent sources to provide a proper color balance that will fit all types of colors of merchandise. Display lighting, he said, is still store lighting and the merchandise must be lighted to be appreciated.

The San Francisco conference was divided into several categories, some running in parallel. This made attendance at all difficult for the 303 total registered for the entire conference or for individual sessions. General sessions prevailed Monday, with light sources covered in the morning and color systems in the afternoon. The president's dinner at the Mark Hopkins Hotel was Monday evening. On Tuesday, residential lighting and street lighting ran in parallel and on Tuesday afternoon store lighting and industrial lighting.

President Manwaring, Vice-president Hobbs

Street lighting drew unexpected interest both in the morning session and at a visit to the University of California field testing laboratory at Richmond Tuesday evening. About 120 had dinner at Spenger's and then went to the laboratory where Dan M. Finch, associate professor, University of California, Berkeley, conducted a tour of the photometric measuring laboratory and the model street setup from which every type of street lighting, from radial wave to fluorescent, was capable of demonstration.

The morning session, over which W. P. Bear, member emeritus IES, presided, had a comprehensive program. David M. Baldwin, director, traffic division, National Safety Council, Chicago, presented a paper on night traffic accidents and the relationship of lighting to them. An interesting aspect of street lighting for the user was talked about by Victor Paulsen, cab driver for the Yellow Cab Co., San Francisco. New developments in street lighting sources were

Schmidt Bear Madigan

Blumberg Hibben

Gerber Delo

Thompson Monsees

presented by Paul Schmidt, lamp engineer, General Electric Lamp Department, Oakland. R. E. Madigan, district manager of lighting, Line Material Co., Milwaukee, described the new Uni-Ballast method of street lighting, the first installation of which in the area is located at Lodi, Calif. Prof. Finch explained the mechanism and theory of the new Finch-Simmons visibility meter and its value in the obtaining of data regarding reflectances and pavement brightness and street lighting effectiveness.

Although publicized widely and invitations issued to architects, interior decorators, home builders, etc., the residential lighting meeting was not as well attended as it deserved to be. The outstanding talk was given by E. W. Commery. That color, like beauty, "is altogether in the eye of the beholder" was his text. He urged designers to pay far more attention to the subject of color. After reviewing what lamp manufacturers had done to develop whiter and whiter light from fluorescent sources and describing the public reaction to their various white lamps, he showed how the public was accepting whiter and whiter light.

Yet in the residence people did not like as much whiteness as the grocer or store owner. Warmer whites are desirable. Thus the settling down to the four standard and de luxe lamps would enable Mrs. Jones to go down to buy lamps without having to be a specialist in the selection of what one to purchase.

Alston Rodgers coats a frosted lamp white

While lauding the color systems and urging a greater practice in applying them, he offered all attending the color sample guide for visual comfort that has been a part of the 1953 recommended practices for residential lighting of IES. With these, he said, it was possible to visualize with a minimum of colors the range of reflectance values that fall within the recommended bands and to increase understanding that colors need not be washed out or monotonous, even with high reflectance value and good color.

Nat Blumberg, Lightolier Inc., Los Angeles, substituted for Jacob H. Blitzer. He told how the Swedish and Italian modern designers had influenced American design and brought back the use of lighting fixtures as a part of the decorative scheme. American designers had recently made surveys to find out what people wanted in the way of home lighting. This he described for each room of the home and suggested that the planning of fixtures be done before the wiring is laid out to make sure of adequate facilities for the lighting that people want. He showed a number of slides of modern fixtures for residential use that fit with the new concept of living.

Because of lack of time, President Manwaring's address, "Architecture and Engineering in Lighting Design," was abbreviated to a statement of the partnership between architects and illuminating engineers. He then went on to tell of the IES, its membership, publications, technical committee work, research fund and lighting standards.

Three entries for the region's contest on "My Most Interesting Lighting Job" were offered to the judges. The winner was S. V. Monsees of the San Diego Chapter, who described the floodlighting of the California Building tower in Balboa Park, San Diego. Tied for second were Cy Hughes of the Northern California Section, who presented a luminous ceiling installation in San Francisco, and Del Reynolds of the Southern California Section, who described a new street lighting installation in San Gabriel.

The industrial lighting session, held at the Merchandise Mart, was strictly on a practical level throughout. Harry Delo and William Reuter of Fischbank & Moore, San Francisco electrical contractors, described the extensive lighting system being installed for the new Ford plant at Milpitas in which distribution is from bus and trolley duct from numerous load centers. The system employs a 480/277-v distribution and has a number of interesting control features that will be made the subject of an article in the future.

"Ballasts for Industrial Lighting" was presented not by a ballast manufacturer but by a consulting engineer, Harold Gerber, Coddington Co., San Francisco. He discussed some of the difficulties in designing an installation with as many as 52 different types of lamps, with a great variety of voltages, operating characteristics, ballast requirements and switch requirements. The problem, he said, was not one only of lighting but of distribution. He likewise debunked the lumens-per-watt figures which do not take into consideration ballast losses. A combination of losses often reduces the lumen-per-watt output as much as 25 to 30%. Auxiliary equipment, such as filters for radiation, further decrease the light output.

Other problems discussed were the effect of ambient temperatures on ballasts, the distinctions between cold cathode luminous tubing, mercury vapor and other types of ballasts. For important industrial areas, he likewise advocated intermingling of mercury lighting with incandescent so that if the mercury goes out from a voltage variation the area will not be without lighting. Overvoltage, particularly with wye-to-wye connections, with attendant harmonics, etc., often give the greatest amount of trouble and he advised against such distribution.

"Industrial Lighting, Past, Present and Future," by Regional Vice-president Leonard Hobbs, Smoot-Holman

New 1,000-w mercury-lamp for large area lighting is demonstrated by Marshall Waterman

Co., Inglewood, covered the history of industrial lighting equipment standards, such as RLM. Bringing these up to date, Hobbs described some of the revised standards now about to be issued by the RLM Institute. Among changes are: the glass-steel reflectors are being discontinued; higher reflectances are being required; fixtures with upward components are being included. It was voted by the RLM group to discontinue the use of tombstone sockets and use instead the compressable metal-back type. Standards, he pointed out, help the consumer to select quality.

Appropriately, the maintenance aspect of an industrial lighting job was used to conclude the meeting. Bert Osterman, T. L. Rosenberg Co., Oakland, after detailing the numerous advantages of proper maintenance, listed seven easy steps to reduce cost and give more light for the lighting dollar. These included: (1) make periodic light meter checkups; (2) have a simplified lamp-replacement plan; (3) establish a periodic cleaning schedule; (4) clean or repaint room and machine surfaces regularly; (5) keep a stock of parts; (6) use labor-saving maintenance devices; (7) maintain proper voltage. He also urged consideration of experienced lighting maintenance contractors, equipped to handle this phase of operation expeditiously.

Inspirational talks embracing both the past and looking into the future of lighting were given by Samuel G. Hibben, past president of IES and now chairman of Light's Diamond Jubilee task committee of IES, and at the San Francisco Electric Club by Alston Rodgers of G-E.

Hibben stirred the imagination with the potentialities still to come in new sources of lighting, atomic power and scientific applications of radiation. He told of the organization of the Diamond Jubilee committee and, to refreshen memory as to what could be done in the way of celebrating, showed a number of slides of pictures taken during the 50th anniversary of the lamp, 25 years ago. He ended with a demonstration of the tellurium lamp, which gives a continuous spectrum instead of one interrupted or made up of several bands.

Rodgers recalled the days of Edison's invention and traced the growth of lighting through several distinct periods. He too left an inspiration of the possibilities of illumination in the future for which the 75 years past have been the first step.

Bombshells at Seattle

"We can tire our eyes and suffer from eyestrain, but when we rest them, they are as good as before." This statement by Willard Allphin, Sylvania Electric Products Inc., Salem, Mass., before the Pacific Northwest Regional Conference of the Illuminating Engineering Society, held in Seattle, April 22-24, caused the eyebrows of some to raise in doubt. Allphin said that "one claim which has sometimes been made by segments of the lighting industry is that working under this, that or the other lighting conditions will ruin your eyes or, putting it somewhat more mildly, will cause permanent impairment of vision. We are assured by all of the leading researchers in ophthalmology, physiology and biology that such fears are groundless."

Another statement made by Allphin on which there seemed to be lack of agreement was this: "For the home, except for the children's study area, which has much the same requirements as school lighting, no formal prescriptions for quality or quantity are in order. In my opinion, whatever the occupants of the home like in the way of lighting is good lighting . . . In home lighting, with the exception mentioned of providing good study light for children, the problem is entirely a matter of personal preference. This should still leave the lighting engineer free to suggest light sources, fixtures and methods, but the home owner will continue to be the final

Potter **Allphin**

Plowman **Lind**

Gardner **Hollingsworth**

judge. He is not performing demanding visual tasks against production requirements, thus most of the points involving visual skills have no bearing. Since no permanent damage occurs from using the eyes under difficult conditions, the solution remains a matter of whatever the individual likes."

Dr. H. C. Hall, optometrist, Seattle, disagreed with Allphin in some of his views. Hall said we definitely adapt ourselves to conditions of seeing and prolonged exposure to these conditions can bring about skeletal changes, psychologically we tend to adapt ourselves to the conditions we face. Allphin said that until ophthamologists and scientists agree, we don't know where we stand; the common-sense viewpoint is the one to use.

Another bombshell was dropped by Carl Lundell, street and traffic lighting engineer for the city of Portland, when he expressed the opinion that mercury will be displaced in a few years by fluorescent street lighting. He said it requires 50 to 100% more mercury or incandescent lighting to equal the seeing ease of fluorescent. Opinions expressed following Lundell's blast indicated general disagreement on the statement made.

An entirely new format had been set for the programming of these Northwest regional conferences. The plan was to have one major speaker of outstanding caliber at each session followed by a panel of four discussion leaders, prepared in advance with 15-minute discussions. In all but the last of the five general sessions topics for discussion leaders were: commercial and store lighting, school and office lighting; environmental and home lighting; and commercial lighting. Ample time was allowed for written questions and discussion from the floor. General satisfaction was expressed with this method of handling the meeting.

Five of the principal speakers were on the program of the Pacific Southwest Regional Conferences, IES, held earlier in San Francisco. These were: A. H. Manwaring, president, IES; Marshall Waterman and Samuel Hibben, Westinghouse; Leonard Hobbs, Smoot-Holman; and David M. Baldwin, National Safety Council, Chicago. A summary of their remarks is given in the report of the San Francisco meeting on p 80.

Even more than in previous years, there ran all through the Northwest conference emphasis on environmental aspect of lighting. This thought was well expressed by Joe Sjursen of Frederick & Nelson's department store in Seattle when he said: make the whole store a show window; do not succumb to the temptation to consider lighting instead of the effect on merchandise; merchandise is the most important thing in the store; do not sacrifice merchandise as a burnt offering by improper treatment of light.

Others voiced similar thought regardless of the type of lighting job. Elizabeth Ayer, architect, Seattle; Paul Thiry, architect, Seattle; and Grace Schoeni, Portland General Electric Co.; Marshall Waterman, Westinghouse, Bloomfield, N. J., and Wentworth M. Potter, General Electric, Nela Park, had previously laid special emphasis on the importance of taking into consideration *all* factors when laying out a lighting installation.

S. Harris of B. C. Electric Co., said the lighting engineer should have within his grasp a full knowledge of the application of color and how to make it work with light to accomplish effective results — each interior is a challenge.

Wentworth Potter said lighting is not static—it is dynamic because we have new sources so that we can integrate lighting with the structures of buildings. Foot-candles and brightness are only a step in development and measurement of utilization — the industry badly needs utilization data, said he.

C. C. White Jr., consulting engineer, Portland, said we can support most any type of commercial lighting if we achieve objectives. Illumination level is not the whole objective, we must take into consideration all factors, utilitarian, psychological, atmosphere, etc., to the end that it helps sell merchandise.

Marshall Waterman remarked that the lighting engineer's job is not solved when he determines quantity and quality, he must go on to that something that makes people say "it is good."

Joseph F. Boyle, consulting engineer, Spokane, digressed from technical phases and dwelt on the economic aspects of a consulting engineer's role and his moral responsibility. He feels that we are encouraging clients to become too cost conscious and that there is a tendency with everyone involved along the line to sell the job down. It is far better, he said, to express lighting as a percentage of over-all cost rather than so much money. Sell the job on the basis of what it will do for the customer, he said.

Paul Thiry, architect, observed that the average lighting fixture is doing its best to keep us from seeing; there is too little attention paid to environment—we use gobs of light with dust-collecting surfaces.

Walter Potter, G-E, Portland, said new sources need proper control equipment if we are to take advantage of them and achieve results. He commented that dimmers offer a big advantage in commercial lighting.

School Lighting

Speaking of school lighting, Willard Allphin said the trend toward wider classrooms, up to 32x32 ft, and lower ceilings, as low as 8½ to 9 ft, are causing us to reconsider practice and will influence fixture design. Blair Plowman, Washington Water Power Co., said we now have many fine new tools for school lighting but that care must be taken with the direct light-

Adam Racine

Travis Scharr

Mozes Reis

ing sources; increased brightness of new sources creates a problem.

Industrial Lighting

The trend in industrial lighting, said Wentworth Potter, is toward fixtures directing 25% of light upward, including good appearance and absence of maintenance. He thinks we will come to the point where we will use polished metals and surfaces in industrial and commercial fixtures.

Marshall Waterman observed that research is needed on the seeing task; that the eye and brain are both involved; surroundings must be taken into consideration; safety in industrial lighting is important; the increasing number of older people in industry has made necessary changes in lighting practice; it is not always feasible to prove the economic value of lighting.

Street Lighting

Following a paper by David M. Baldwin on the lighting-safety relationship, the panel on street lighting, outdoor lighting and industrial safety lighting was heard from. Tom Chapman, Linc Material Co., said we can save money and save power with direct connected (ballastless) mercury street lighting. Carl Lundell's remarks have been mentioned previously.

Outdoor lighting as applied to safety was covered by Dave Mozes, General Electric Supply, Spokane. He gave foot-candle requirements for various plant areas and said plant roadways should be treated the same as streets. Henry Haber, Benjamin Electric Mfg. Co., Seattle, discussed lighting as related to industrial safety. Falling glass is a frequent cause of accidents and damage, he said. Many applications call for heat and impact-resistant glass. Know the problem and specify the proper type of equipment, said Haber.

These points were made in discussion from the floor: some research should be done on the reflectance of paving surfaces; an experiment in Victoria, B. C., showed enthusiastic reception to fluorescent street lighting; it is not so bad to drive into intersection lighting, but the wall of darkness faced by a driver leaving the area should receive some attention; some reception to fluorescent street lighting; should be graded, the same as with tunnels.

Five lighting installations were entered in the "My Most Interesting Lighting Job" contest. First prize went to E. E. Ackland, B. C. Section, for the lighting of St. Anslem's church. Winners of second place were D. E. Seely and E. W. Moore, Portland Section, for the flooding of the construction work area at The Dalles Dam. Third award was to P. F. Fletcher of the Vancouver Island Section for the lighting of Butchart's Gardens at Victoria.

Conference chairman was K. E. Hollingsworth and program chairman was Harold A. Gardner. Chairman of the Puget Sound host section is Raymond E. Adam. Walter J. Lind, Vancouver, B. C., is regional vice-president. The 1955 conference will be held in Vancouver, B. C., April 21-22.

Arizona Holds Class

A two-day intensive course in illumination was presented by the Arizona Chapter of IES April 30-May 1. Instructors were F. J. Rohring, Southern California Edison Co., Los Angeles; J. R. Jones, regional engineer, Westinghouse Lamp Division, Los Angeles; Donald T. Carter, General Electric Co., Lynn, Mass.; Carleton M. Thompson, lighting engineer, San Diego Gas & Electric Co.; Ross Hendrix, optometrist, Phoenix; P. G. Young, Western Clay Products Co., Phoenix; Dave Demaree, consulting electrical engineer, Phoenix; J. D. Whitnell, and Bevan Jones, sales consultants, and William Downey, residential lighting advisor, Arizona Public Service Co. Whitnell was director of the course. Three sessions, three hours each, were held on Friday night, Saturday morning and afternoon. A charge of $1.50 for members, $3 for nonmembers was made. This chapter will be host in 1955 to the Intermountain Region IES conference in April.

Black light experiments are effective in determining species of insects affecting crops

Black Light Lures Bugs

Ultraviolet or black light is being used to trap insects in a cooperative experiment between the department of entomology and the Idaho farm electrification committee at the University of Idaho to determine species of insects that may be affecting crops. Entomologists have found that some insects are not lured by white light—hence the experiments.

On a three-night run, with the black-light trap shown, Dr. W. F. Barr of the university caught 69 different species of cutworm moths or millers, 20 species of which had never been reported from Idaho.

Light traps are used by entomologists to determine what light-responsive insect species are present in a given area and the relative abundance of the species. Black-light traps offer an important new tool in this type of research and may offer as well a means of control.

Commercial exhibits on the main floor and educational ones on the balcony of the hall

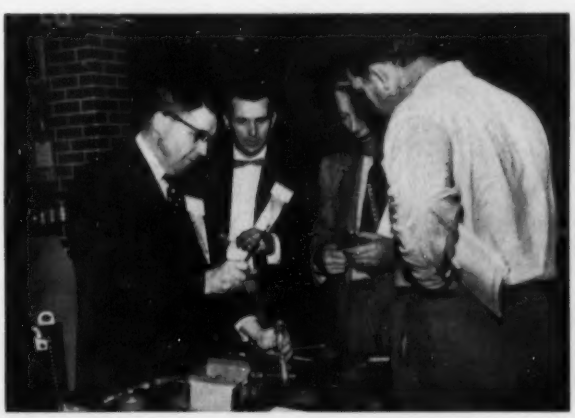
Speaker Borda, President Rejda at luncheon

Johnson presents NIAA award to Esterbrook

Bob Germann, unit service panel assembly

Industrial Show a Success

Launched at a big luncheon attended by 200 and with an inspiring address on the responsibilities of the maintenance engineer and the interdependence of the electrical industry by I. W. Borda, vice-president, Okonite Co., San Francisco, the 1954 Electrical Industry Show of the Electrical Maintenance Engineers Assn. of Southern California was seen by 9,000 selected persons, April 1-3, at Shrine Convention Hall, Los Angeles. Larger than any previous industrial electrical show it made space for 87 commercial exhibitors on its main floor and 17 educational exhibits on the balcony, principally by the technical training departments of colleges, trade schools. The three awards for "most informative exhibit," selected by the Purchasing Agents Assn., were given by NIAA to Leach Corp., first place; Allen-Bradley Co., second; U. S. Electrical Motors, third. Cal-Poly College at San Luis Obispo won first place and L. A. Trade-Technical Junior College first in its group, with scholarship prizes.



Karl Kempf pounds on a new T&B plastic insulating bushing

John Elliott shows Ideal's new Wrap-Cap and crimping tool

Before conversion to mercury, old units were only 22 ft high

Raised to 30 ft above curb with 15-ft extensions and 6-ft brackets

Extensions Modernize Seattle Luminaires

New extension and bracket with ballast on pole top. Grouting pipe was later removed

Time as well as money were saved by Seattle by converting existing standards of its former street lighting system by means of an extension and bracket arm assembly. The extension, fabricated by Pacific Car & Foundry Co., consists of a fluted pole that fits over the existing lower pole section, is joined with a grouting compound.

The fluted extension, which matches the existing fluted base, is fitted at the factory with a cast steel cap and bracket holder, hot dip galvanized. The ballast for the mercury lamp fixture on the bracket is bolted on the top of the steel cap.

Lighting unit is a G-E form 109 luminaire equipped with 400-w, 20,000-lumen mercury-vapor lamp. With the extension the luminaire is 30 ft above the curb, whereas the old incandescent luminaires were only 21 ft 11 in. An average reading of 2.5 f-c on the pavement results.

Speed was attained in conversion by Donald Close Co., contractor, by this preassembly of the conversion extension and bracket. In 20 minutes the old fixtures were removed, the extension fitted on, connections made and the lamp ready to light. Use of the old bases and lower pole sections eliminated the need for rewiring the traffic controls, alarm and communication systems mounted on the existing poles. Simple rewiring of the street lighting circuit made it possible to operate the lights the same night they were installed.

ELECTRICAL WEST Contractors' News Letter

QUICK NEWS ON TRENDS, LAWS, CODES, MATERIALS, EQUIPMENT, COSTS, WAGES, ETC.

Tragic irony

Unselfishly Lloyd Flatland pleaded with the San Francisco Electrical Contractors Assn. for years to set up a health and welfare plan for its own contractor members. After the union had put across such a program for the electricians, the contractors finally decided on one for themselves. It went into effect May 1, under the Blue Shield CPS plan. But that was too late to do Lloyd Flatland or his family any good. From overwork on behalf of the association he had a stroke and died April 16.

Gave all to others

No man in the West in the past 30 years had ever given so much of his time, money, energy, ingenuity, inventiveness and devotion to his fellows, his competitors and his industry as had Lloyd Flatland. Of late, because of health, he worked in the committees instead of as a leader. During the NRA days he bore the brunt of travel, meetings, intensive work on code writing and administration, criticism and resistance with little help and less appreciation. At the end of NRA the plans for self-government and good trade practice, for which he labored so hard, were abandoned by his group and he returned to try to rebuild his neglected contracting and motor repair shop business. Several administrations ignored him but lately he was put back into the team. He is more sincerely missed by his fellows than any of his contemporaries may be.

Wasted

If governments and labor unions do not stop taking up so much of a contractor's time with paper work and negotiations, he will not have enough of it left to sell more work to support both the government and the union. This paper work, the time-consuming meetings and negotiations that are stalemated, and other nonproductive effort can kill off the contractors that support both. Only the big operators will be able to survive such overhead.

Better outlook

Construction picked up noticeably in March and April but still has not reached full employment. Most of the work is in private housing and in a few large projects. Commercial work is largely remodeling. Total cost of a new structure, balanced against the income it will bring, has discouraged several new large building proposals.

Wrong methods

Scaring customers into rewiring by giving the impression that he represented the city electrical inspector or the utility company was charged against an Oakland estimator, D. L. Christner, by Berkeley Electrical Inspector D. D. O'Leary. The State Contractors' License Board brought the complaint. Investigations are also underway in the Oakland area of possible FHA Title 1 overcharges and kickbacks by high-pressure home reconditioning salesmen.

Save face?

The buck is being passed to the Council on Industrial Relations to decide wage and fringe issues in an exceptional number of cases this year. Los Angeles Chapter, NECA, and the union had agreed on a 10c increase now and 5c in 12 months, on an 18-month contract, but this was turned down by the members . . . San Francisco negotiations are stalemated. The union is asking a 10c increase, the contractors, with slack business, are demanding the status quo . . . In Oakland, Contra Costa County and Vallejo the Northern California Chapter, NECA, and unions will all go to the council over issues. Contractors had asked a moratorium on increases until business conditions improved but union members demanded more. They asked a 10c wage increase and paid holidays, and parking fees. The council meets in Pittsburg in May.

Bad example

Making it difficult, the Associated General Contractors granted a 10c an hour package raise to carpenters and other building trades in 22 northern California counties effective June 1. Part of the 10c raise was for an increase in the health and welfare, from 7½ to 10c an hour. It will make the carpenter scale $2.77½.

Revived

FHA from Washington announced that applications for mortgage insurance gained at a greater rate than a year ago during April. It also announced appointment of 52 new directors, most of them with business backgrounds.

Other areas

Phoenix has no negotiations this year but under its agreement of last year the scale goes from $2.90 an hour to $3 on June 20. In Tucson the negotiations were on for the same conditions . . . In Seattle the request for a 50c an hour increase seems to have fizzled out as business conditions have not warranted any such increase.

Whose ceiling?

Luminous ceilings and who will install them promises to become a major jurisdictional battle. The electrical contractors and IBEW have been losing a number of ceiling installations to carpenters and to acoustical specialty contractors, electricians merely wiring in the fluorescent strip. Some luminous panel manufacturers are playing with them in order to offer cheaper installation. Other electrical fixture manufacturers are lined up with contractors and IBEW, claiming the entire ceiling is a fixture. There are threats of picketing and strike action.

Challenged

Another NLRB case has been filed in Alaska against the Alaska and Puget Sound Chapters of NECA and the union over a performance bond requirement in the contract that the union required. Hearing was to be held May 3 and the closed-shop issue may be brought into it.

Blaze a trail

Lightorama, with two truckloads of equipment from Nela Park, Cleveland, toured the West presenting General Electric Lamp Division's selling story to dealers, distributors, utility people and large consumers. Alston Rodgers, director of the Lighting Institute, Bob Oetting, office lighting manager, Will Fisher, store lighting manager of Nela Park, and a company of three professional actors presented "Lightorama" at Phoenix, San Diego, Los Angeles, Fresno, Sacramento, San Francisco, Portland, Seattle, Spokane, Salt Lake City and Denver. The presentation was usually in four separate parts—a meeting for utility personnel, another for dealers and distributors, one for miniature and sealed beam automotive lighting, and another for photographic dealers and distributors. The largest lamp bulb in the world, a 75,000-w lamp, was lighted, lamp features were shown in 3-D, and a strong selling story presented.

Turnover

Electrical Contractors of Washington Inc. introduced its new officers at the annual contractor-wholesaler dinner April 29 in Seattle. M. W. Hartzell was elected president to succeed Arthur Siegal, who did not run again for the office. Wesley R. Bronson is vice-president, T. Ralph Neilson, secretary-treasurer. Board members are Ronald J. Gracey, Edward J. Hoff, Lyle D. Nelson, Ernest A. Shook and Siegal.

Bigger quarters

Graybar Electric moved to a new headquarters in Spokane as Vern E. McCain, branch manager, held open house to some 500 April 9. New quarters are at 1033 Gardner St. Former location was 152 S. Post. John P. Lawton, district manager from Seattle, and C. C. Bradbury, district credit manager, attended. The new place has 45,000 sq ft of space.

Split up areas

Reassignment of territory for the field men of National Electrical Contractors in the West was made by Paul Geary, executive vice-president, last month. Matt Sherwood, who was regional director, now has the California and Nevada territory, and Joe Bollinger the other seven states and Alaska in Districts 6 and 8. He makes his headquarters in Spokane.

Full time job

Robert Wilkinson has resigned his position as manager of the Inland Empire Electrical League in order to devote full time to the Spokane Chapter of NECA. He has been sharing the two jobs. Recent additions of branches in southern Washington requires his full time.

New chapter

A Santa Clara and San Benito Counties Chapter of NECA is now a reality. The independent association voted to join NECA and a charter has been granted. George Harter, a former NECA field representative, is manager. Ray Rosendin remains president and so do the other officers. A governor is to be elected. The chapter, with some 34 members, recently inaugurated a foremanship training course in conjunction with local 332, IBEW, and the San Jose adult education department. There are 53 members enrolled (story coming later).

Other NECA news

Santa Cruz, Salinas and Monterey contractors are working toward forming of a Monterey Bay Chapter under R. G. MacBeth, manager of the Associated Mechanical Contractors Assn. A bid depository is planned, the same as in San Jose . . . Redwood Empire Chapter in San Rafael has started estimating classes and likewise plans a bid depository . . . There were 110 applicants for the vacant job of Montana Chapter manager. Selection has not yet been announced. Headquarters of the Montana Chapter is to be moved to Helena, the state capitol.

Alaska elects

Alaska's NECA chapter elected Percy Bergt as its president, Charles Siegel, vice-president, Joe Marshall as treasurer, R. B. Groseclose, governor, and Jerry McKinley, additional director. Robert Marsden is manager. The chapter moved to new quarters at 304 E St. in Anchorage. It has an estimating class underway with an enrollment of 10, taught by Joe Marshall. An accounting course is being planned. It also has a joint apprenticeship program with both inside and outside classes, using the Oregon State course.

A package needed

Financing of home wiring in old homes is being considered in many areas. The Arizona Public Service Co. announced its new program of financing to a large dealer and contractor meeting in April. Northern California Electrical Bureau is working on a program. Other Western utilities and leagues are looking into the Cincinnati plan. It is felt by many that merely advertising adequate wiring for home modernization leaves too much negotiation up to the home owner to get it done. To offer a package with easy terms will solve the problem. Arizona's plan is called "The Missing Link." (See story in the June issue, Electrical West.)

Easy to follow

A set of wiring diagrams to picture in detail the various phases of house wiring from service entrance to fixtures and outlets is offered by Home Building Plan Service, 2454 N. W. Sandy Blvd., Portland, Ore., for $5 a set. Each set contains three large blueprints, 18x29 in., with typical floor and basement plans. They were prepared by a registered professional engineer.

Desert A-W

Yuma, Ariz., now has an Adequate Wiring Bureau, recently organized by Arizona Public Service Co. and local people. Chairman is Al Weber, Mohawk Wholesale & Equipment Co., vice-chairman, M. L. Mitchell of E. C. Junken Electric Co., Gabe Abell, Arizona Public Service, is secretary. Other directors are Mel Troop, Troop Construction Co., E. A. Eaton, Arizona PS, Jerry Kelleher, NECA manager, Phoenix, Willis McAlpine, city inspector, Yuma, and on the standards committee are Weber, Mitchell, Abell and W. L. Platt of Curley's Electric Co. Tentatively planned is a model home in conjunction with a local builder.

Independents organize

A new electrical wholesalers association was formed in Los Angeles for the southern California area south of Fresno. Its primary purpose, enunciated at the April 20 organization meeting at Los Angeles, is to seek enforcement of the Robinson-Pattman Act and of a set of fair trade practice rules approved by the Federal Trade Commission. Of 55 firms in the area with 70 branches, 25 or so joined. Temporary officers elected were George Bert Smith, Coast Wholesale Electric Co., Burbank, as chairman; Dave Silverman, Crown Wholesale Electric Co., vice-chairman; Carl Smith, Electrical Distributors Inc., treasurer; and directors, Sam Gryde, Standard Wholesale Electric Co., John Chapman, California Wholesale Electric, L. A. Duncan, Ladco Wholesale Electric, C. O. Armstrong, Argo Electric Supply Co. Meetings are held every third Tuesday of the month. Harold A. Slane, at present executive secretary and legal counsel to the Wholesale Plumbing Institute of Southern California, is the manager.

Next big show

Western Plant Maintenance Show, to cover maintenance of all types, not electrical alone, will be staged at the Pan Pacific Auditorium, Los Angeles, July 13-15 by Clapp & Poliak Inc., managers of similar shows in Cleveland and the east. One feature of the show will be a maintenance conference under the general chairmanship of L. C. Morrow, consulting editor of "Factory Management and Maintenance" magazine, New York. For this a number of prominent speakers among the Western industries have been signed. On the program of the first day's conference is "Maintenance of Electrical Equipment." L. A. Beck, G-E Co.; Philip Belsky, Westinghouse; B. L. Peak, Sterling Electric Motors, are three electrical people on the program.

Return

A. A. Gingell, who from 1949 to 1951 was U. S. Rubber Co.'s representative in the West, returns to take on the factory representation of the Wire & Cable Division, with offices at 6025 Third St., San Francisco. Thus U. S. Rubber returns to the setup it had when the late Fred Benz was its representative. Later he became a manufacturers' representative and handled the line. A return to the former arrangement was decided upon after a survey of conditions in the field and appraisal of the Western market.

Men and lines

Among people: James F. Crafts, president of Fireman's Fund Insurance Co., San Francisco, was elected recently to the board of trustees of Underwriters' Laboratories Inc. . . . John Thomas Carey, Honolulu's city electrical inspector, well known to IAEI in California, celebrated his 65th birthday and declared he would not retire until 70 . . . Michael Curry, former sales engineer for Western Insulated Wire Co., is now its agent in San Francisco at 224 Mississippi St. His other lines are Trico Fuse and Tobe Deutschmann Corp. Western Insulated Wire was formerly handled by Electric Agencies . . . Among new distributors appointed by U. S. Rubber Co. for its Uskon electrical radiant heating panels is North Bay Electric Works Inc., San Rafael . . . Frank Andrews, Modesto, electrical engineer, won an appeal for a hearing before the State Board of Registration for civil and professional engineers. The Third District Court of Appeals ruled in his favor. He had been refused an engineer's license previously, even under the "grandfather's clause" even though he had practiced engineering for a great many years.

. . . and other changes

More: Kuchel & Sievers Electric Works, San Francisco, has been appointed authorized parts distributor and service shop for the Breuer Electric Mfg. Co., makers of Tornado blowers and vacuum cleaners . . . Sil Chapari and Don Solomon, both General Electric Supply Co. salesmen, left that company to open an electric supply business of their own in San Francisco . . . Otis L. Hinson of Electric Supply Inc., El Centro, has opened a branch in Phoenix, Ariz., at 202 S. Seventh Ave. Hinson was formerly a contractor in El Centro, later started a supply business . . . R. E. Tweedy recently set up a manufacturers' representative business in Phoenix at 914 W. Madison St. He handles the Ilg Electric Ventilating, Oliver Iron & Steel, Revere Electric Mfg., Day-Brite, Louis Allis, Remington and Zinsco Electrical Products lines.

For light economy

First installation in the West of the Uni-Ballast system (of Line Material Co.) for street lighting was recently turned on in Lodi, Calif., in its business district. According to H. D. Weller, city manager, about $90 per unit was saved by eliminating the need for regulators and will likewise save current.

Show to sell

Gilson Supply Co. repeated its very successful manufacturers' exhibit for the second year on April 29-30 and May 3-4 at its warehouse at 1148 E. 18th St., Oakland. Manufacturers showed and demonstrated electrical equipment and supplies to an invited audience of contractors and dealers.

Expands

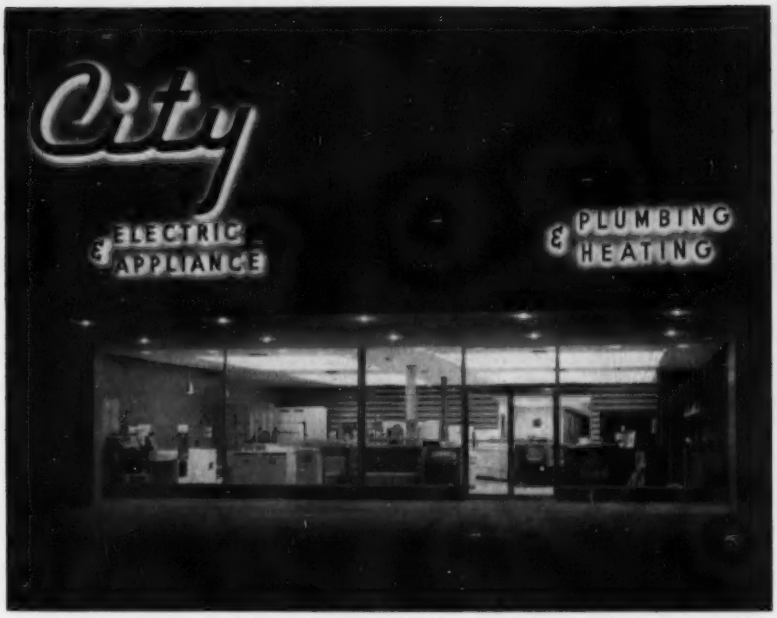
Corona Mfg. Corp., Glendale, makers of infrared industrial ovens, has decided to expand distribution to the whole United States. Agreements were made with Merco Industries, Seattle, relative to patents and distribution.

Compact, silent

Arrow-Hart & Hegeman now makes the Quiette switch in the interchangeable type with the screwless wire lock terminals and line feed through shunts on single-pole models. These are usable on the highly inductive load fluorescent jobs at 277 v a-c, where space is a factor.

Unit idea

Allen-Bradley Co. has ingeniously used the unit system in several new developments. One is a line of oiltight limit switches, the base of which is standard but different operating heads can be used for any specific type of operation, whether fork lever, push roller, push rod, etc. . . . The same idea is applied to terminal blocks. They can be assembled in any required groups as needed . . . A similar idea is applied to auxiliary contracts where an extra contact of pilot duty rating is needed on contactors or starters. These are simply added to any of the solenoid-type contactors in the field. Each of these new devices increases the flexibility and reduces inventory of complete assemblies.



With a modern new face and remodeled interior for display and headquarters and by...

moving its warehouse and shop to service its 28-truck and car fleet three blocks away

Second Half-Century Off to Good Start

If the first hundred years are the hardest than the Burnzens who founded City Plumbing & Heating Co. in Boulder, Colo., 50 years ago are over the worst half of it and certainly, with modern facilities and organization, are set to do the next 50 under acceleration. It is now City Electric & Appliance as well as plumbing and heating, the original company dating to 1904 when three brothers, Frank, Ben and John Bernzen, started the firm. In 1918 they moved into the present location at 1121 Walnut St., a building also about 50 years old. Since 1927 it has been in the electrical appliance and contracting field.

Growth during the years had caused it to overflow into three more locations—a yard and warehouse across the street, storage rooms on the second floor and a warehouse two blocks away. The garage door facing on the street before remodeling became access of over 50 workmen and their trucks to an overcrowded stock room.

50-year-old building before its face lift

Recognizing the importance of merchandising the appliances and services more attractively a program of modernization was begun. First step was to consolidate service facilities in a new single location three blocks away. Here are ample stockroom, warehouse, yard, shop and dispatch facilities. This solved an acute traffic problem by moving the activity of 28 company-owned cars and trucks from the main store and providing a customer parking lot across the street.

With building space available, the second step was to make new office space, auxiliary display rooms, drafting room, appliance and TV repair shop there. Then the front section was remodeled into a single 2,500-sq-ft display room for the plumbing, heating, electric and appliance merchandise. The entire second floor is now occupied by an expanded sheet metal department.

Operating procedures were then streamlined and clearly defined for efficient conduct of inventory control, material purchase and issue, workmen dispatch, truck maintenance in a company garage, cost accounting, job analysis, collections, etc.

When this was all done a grand opening was planned to capitalize with publicity both the new facilities and the golden anniversary of the company. Between 3,000 and 4,000 responded to the newspaper special sections, formal opening promotion, door prizes, refreshments, searchlights, radio broadcasts.

Ben and John Bernzen, still active in the business, were early joined by George and J. Robert Bernzen, sons of John, the former an electrical engineer, the latter mechanical engineer, both with military service experience. The other brother, Frank, died in 1944. George Bernzen runs the City Electric & Appliance Co. end, Bob the plumbing and heating. Ben Bernzen is president, John vice-president, Robert secretary, George treasurer.

ELECTRICAL WEST

Dream or Nightmare ?

AS distribution engineers worry and labor over the problem of serving the greatly expanded residential loads of the future why not examine this possibility: Equip each of the new potential 25,000-kwh-per-year homes with its own metal clad unit substation incorporating a dry-type transformer and a customer's load center. Examination of this seemingly radical suggestion will reveal that it has merit.

Suppose that a small compact cubicle were designed for installation on the customer's premises. One of its two compartments might contain the transformer, fuse protection and meter. It would be inaccessible to all but utility personnel. The other side might contain the customer's main breaker or switch and load center. It would open into the home. Suppose that all future new residential tracts were laid out with the idea of incorporating such installations. It is immediately obvious that all service could be underground. The 25,000-kwh homes with their individual cubicles could be served by 4-kv, 7.2-kv or 12-kv single conductor direct burial cable with grounded neutral. The primary circuits could be either radial or loop, preferably the latter for flexibility. For homes with potentially lower consumptions the primary voltage might be 480 v from two-wire secondaries with two-wire 480-v service leads.

Utopian? Perhaps. Impractical? Not necessarily. The idea has plenty of merit. It solves many of the distribution engineer's problems. It immediately obviates the almost insurmountable barrier of changing from the universal 115-v American standard for lamps and appliances when considering higher utilization voltages. The hazard of higher voltages is eliminated. Customer's voltage would remain 120/240 with grounded neutral. Equipment and voltages all conform to present standards. Problems attendant on underground service to large tracts are solved. There is no limit to customer's load that might be served, since transformer size could be changed as load increased. A phase-converter could supply three-phase service for air-conditioning equipment. And these are only some of the benefits.

It has been said that a problem presents a challenge that turns into opportunity. Here is a problem that is both a challenge and an opportunity for the distribution engineer to make history if he works out design details and sets standards for the system suggested.

Supervisors Must Be Salesmen

REACTIVATION of sales programs all over the West is pointing up the lack of trained salesmen. One industry leader commenting on this problem succinctly observed, "what we really need first is a training program for our sales managers and sales supervisors. They too have forgotten how to sell." The statement is startling—maybe it is true. Back in the old days sales supervisors were hard-hitting and fired with a zeal that paid off in load building. Shortage of power and shortage of merchandise that made sales come easy during the past decade may have lulled some into complacency. But the man who directs sales in 1954 and the years to follow must be one who has not forgotten the old art of selling. He must be alert and well versed in modern techniques of merchandising or else the industry's sales programs are going to fall short of achieving hoped-for results—that's for sure.

Where Are Our Sales Records ?

THE ghosts of the West's late great salesmen must have held a solemn and sad meeting following the announcement of the industry awards for sales achievement at last month's Edison Electric Institute sales conference. Only two Western utilities were listed among the winners. One could almost hear the ghosts whisper, "Where, oh where is the promotional initiative and the sales drive that made our companies so outstand-

EDITORIAL VIEWS

ing in every field of selling endeavor?" How the spirits of the Frosts, the Fishers, the Parrys, the Bigelows, the MacFaddens and the Bucks must have mourned over this sorry showing. Time was when the Western companies excelled in every phase of selling and promotion. They pioneered every new load-building device. And they had winners in every national contest. Lest the ghosts despair completely, however, we see a re-awakening and a new awareness of the need for selling the advantages, the benefits, the convenience and the economy of electric service. And we foresee a new crop of salesmen who will once more put this region in the forefront of industry promotional and sales activity.

Local Partnerships Are Best

THE manner in which electric systems of the Pacific Northwest have reacted to the new federal power policy of local responsibility and cooperation should set at rest any fears expressed by the die-hard federal power bureaucrats. It is heartening to see how many groups and single utilities are probing new power development possibilities.

Five utilities have organized the $50,000,000 Northwest Power Co. to develop two sites on the Clearwater River. Portland General Electric Co. has proposed a three-way partnership involving private and publicly owned utilities and the Corps of Engineers to develop the John Day site on the Columbia River. The cities of Seattle and Tacoma, Puget Sound Power & Light Co. and two western Washington PUDs have set up the Puget Sound Power Pool to coordinate power development plans of the individual agencies. Several PUDs have discussed a joint agency to look after their future power requirements.

These and other similar activities simply demonstrate that given an opportunity local utility systems can take care of themselves and their customers. No patronizing federal benefactor is needed.

You Can Say That Again

IT is well known that we are faced with a severe shortage of engineers and scientists if we are to continue to maintain and develop our industry and defend ourselves. The possibilities of a career in engineering and science have not, as a rule, been sufficiently emphasized in our elementary and secondary schools. The reason is because that is a job for technologists working through local school boards as members . . . Technologists owe it to themeslves and to their country to infiltrate all sources of education because it is a notorious historical fact that in time of great change, educational institutions do not satisfy current requirements and must be subjected to outside influences. Where one-third of the Roman population possessed two human slaves per capita, every American has 260 slaves per capita on an energy basis. Technology made slavery unprofitable and thereby accomplished more than the Decalogue and all the fiats, edicts, decrees and proclamations put together. Technology has accomplished more for civilization than all the other efforts of the human race. Technology has created new problems in human relationships and it is the job of the liberal arts professions, the social scientists and government to find appropriate answers. The vulnerable point in our national economy is the effective and efficient distribution of the profits due to technological progress. Gross, or long-continued cupidity on the part of management, labor, the consumer (the bulk of the voters) or confiscatory taxation can send our economy, our people and our Western civilization into such a tailspin that we will lose everything which we possess—even liberty.—Vice Admiral Harold G. Bowen, USN (Ret.), executive director, Thomas Alva Edison Foundation.

Doubling as local chairman in home-town San Diego, E. W. Meise also covered kitchen and laundry planning for several others as

Business Development Tours PCEA Area

Speakers at San Bernardino, Walt Stickel, Leon Dame and J. F. Gensley Jr., banker

Six times as many Pacific Coast Electrical Assn. members, a total of almost 2,000, were able to participate in and attend the Business Development Section in its 10 regional meetings than were in attendance at the last single session conference. This is the record just rung up by Walter Chapman, San Diego Gas & Electric Co., chairman, and Jack Corlett, General Electric Co., San Francisco, vice-chairman of the section, as the 10 sessions concluded April 8 at Phoenix.

A summary shows:

Total attendance was 1,976 and was made up of 23 engineers, 8 home economists, 57 appliance dealers, 27 bankers, 165 distributors, 130 manufacturers and agents, 154 contractors, 24 builders, 43 architects, 800 utility people, 25 public officials, 38 inspectors, 20 pump dealers, 25 farmers, 16 from the press and 221 miscellaneous, including 4-H members.

Attendance at Sonoma was 168, San Jose 225, Marysville 178, Visalia 142, Long Beach 244, San Bernar-

President Pengilly, Henry Sargent, Ariz. PS Co. president, and Marjorie Helm, at Phoenix luncheon above. At San Jose, below, W. R. Bowler, PG and E, San Jose; I. W. Borda, speaker; D. S. Aiken, PG and E; Louis Wollenberger, Coast Counties, co-chairman; Jack Corlett, section vice-chairman, and Luff Rush, PG and E, Stockton

dino 222, Santa Barbara 229, Reno 200, San Diego 205, Phoenix 163. Many attending had never before attended a conference or convention of PCEA. As will be noted above, utility membership was overshadowed by dealers, contractors and others. According to Chapman, "the conferences certainly were not packed by utility people."

Speakers numbered 26 in all, again spreading the participation to a large number of PCEA members and others.

On home lighting, speakers were Robert Thunen of Sylvania, Douglas Aiken of PG and E, Roy Cameron, Westinghouse, Paul Schmidt, G-E, J. Long, Moe Lighting, A. A. Reitman, G-E, and Roy Jones, Westinghouse.

Agricultural power speaker was Frank Miramontes, PG and E. The 4-H speakers were E. Stahl, PG and E, George Sullivan, Southern California Edison, Dan Turner, San Diego Gas & Electric.

Home economics skits were presented under direction of Marguerite Fenner, PG and E, in the northern meetings and Marjorie C. Helm, California Electric Power, the southern meetings. The home economists of the local companies participated in the skits.

Kitchen and laundry presentations were made by E. W. Meise, San Diego G&E.

Commercial and industrial lighting was presented by Paul Schmidt, G-E, and Roy Bevan, Sylvania.

Commercial and industrial power was given by Donald Doub, PG and E, and C. J. Bunce, SDG&E, William Kyte, G-E, Leon Dame, So. Calif. Edison, Stanley Johns, Westinghouse.

Television speakers were James Tuttle, Motorola, and W. L. Stickel, Hoffman.

Adequate wiring, residential, was presented in the north by Walter Abraham, PG and E; in the south by A. B. Smedley, consulting engineer, from script prepared by Robert Dowd, California Electric Power.

Principal speakers at the luncheons or dinners were O. R. Doerr, vice-president, PG and E, at Sonoma and Marysville; I. W. Borda, vice-president, Okonite Co., in San Jose and Reno; James Tuttle, Motorola, Visalia; J. F. Gensley, Bank of America, at San Bernardino, Santa Barbara and San Diego; W. B. Paul, Los Angeles Stock Exchange, Long Beach; W. O. Kyte, General Electric Co., Phoenix.

After determining on the regional meetings at a guidance committee session, assignments were made for the various topics and the first rehearsal was held Dec. 17 in San Francisco. At this, the regional meeting chairmen were asked to select which of the topics they wished to have on their local programs. From these selections final rehearsal was held in Fresno Jan. 22. Each program contained five or more of the total of ten plus a principal speaker. Full daytime meetings were held in Sonoma, San Jose and Marysville; afternoon meetings in Visalia and Phoenix; evening meetings at Long Beach, San Bernardino, Santa Barbara, Reno and San Diego.

The regional meeting chairmen were: for Sonoma, Harry Patton, PG

Hartley **Doerr**

Turner **Chapman**

Reitman **Bunce**

Home economics skits—At San Bernardino, with Ralph Munton, Cal. Elec. Power; Dorothy Hughes, Sues, Young & Brown; Lorene Kraft, Westinghouse. At Sonoma, Maxine Gentis, Sacramento, and Helen Palmer of Stockton PG and E as the housewife prospect

and E, San Rafael; San Jose, Douglas Aiken, PG and E, San Jose, Louis Wollenberger, Coast Counties G&E, Santa Cruz, Dave Nock, PG and E, Salinas; for Marysville, Fenton Kraft, PG and E, Marysville; for Visalia, Les Quinby, So. Calif. Edison, Visalia, Vern Redman, PG and E, Fresno; Long Beach, C. M. Campbell, So. Calif. Edison, Long Beach; San Bernardino, Robert Neuman, Calif. Elec. Power, W. K. Dunkle, So. Calif. Edison, both of San Bernardino; for Santa Barbara, E. B. Cummings, So. Calif. Edison, Santa Barbara; for Reno, A. L. Pierce, Sierra Pacific Power, Reno; for San Diego, Ed Meise, SD&E, San Diego; for Phoenix, Jack Kiedaisch, Arizona Public Service, Phoenix.

Backing up the regional chairman were some 50 or more local electrical people from the utilities, dealers and distributors whose names are unobtainable but are deserving of the credit for the fine attendance and arrangements for these meetings.

The Program

Home lighting—What the home lighting situation is today, what the PCEA goals are, and the promotional and other methods to reach these goals, were presented in the home lighting talk. Illustrations showed many places where improved lighting could be used in the homes. Present budgets for lighting fixtures are as low as one-half of one per cent of the cost of the house; should be 2% for the $15-20,000 home, for better homes even higher. The tools suggested for use were the Better Sight Bureau material, lamp and fixture manufacturers promotions, dealer programs to teach and to help sell equipment, training to architects and engineers and designers, model homes, etc.

Agricultural power — Advantages of sprinkler irrigation over ditch irrigation for many applications were stressed and it was shown where it saved labor, gave better water control and distribution, saved water and made it go further, was preferable on rolling land over which it would make irrigation possible where other methods failed.

4-H demonstrations—Were held in practically every meeting. Local 4-H club members with electricity projects demonstrated their projects, which ranged widely over electrical uses and ideas. The value of this work to the industry and to the youth was stressed.

Adequate wiring — How "Oscar, the octopus," was strangling the convenience and efficiency of the use of electricity in the home was well illustrated both by Oscar himself and a slide presentation showing the difference in appearance and in service to the user from adequate wiring.

Home economics—In a skit "Selling Is Telling," two home economists and a "dealer" enacted two scenes

Speakers James Tuttle, Donald Doub and Paul Schmidt. Oscar the Octopus and tamers Robert W. Dowd and Walter Abraham

Frank Miramontes, PG and E, charts the cost per acre advantages of sprinkler irrigation—more power but less labor

Teams of 4-H boys and girls gave demonstrations of their electrical projects at each meeting—this was at the Marysville one

in a dealer's store to illustrate how the services of a home economist tell the customers the benefits to be derived from electric kitchen equipment and help to sell for the dealer.

Kitchen and laundry planning—With slide presentation the basic planning of a kitchen was illustrated and it was shown how the three work centers should be planned for in the sale of any single appliance or of the whole kitchen.

Commercial and industrial lighting—With a theme "The Best Costs Less," illustrations were shown of several new methods for lighting, such as luminous ceilings, upward component and industrial lighting, new reflector and projector lamps, to provide the best lighting which in the end would cost less. Importance of maintenance was also shown by a physical demonstration of the depreciation of lighting on a fixture from dirt, voltage losses, burn outs, etc.

Commercial and industrial power—New methods and devices available and the business opportunities connected with them in power installations were shown. Progressive mechanization, infrared applications, heating, high frequency heating and treating, supervisory controls, industrial television, cybernetics and food sterilization were mentioned. The heat pump and its possibilities in air conditioning were discussed at some length. In 1953 there had been 250 3- to 5-hp installations. It was predicted by 1962 there would be 2,000.

Television—The tremendous and sensational growth of television was reviewed and all were advised not to ignore it. Television saturation has reached 70% where it is available. The dealer, distributor and manufacturer mortality and causes of it were discussed. The color systems were explained. Importance of UHF in covering the fringe areas with more and more stations was told. Color TV was described as a superior challenge and would present the second or third great money-making opportunity of this half century. However, its problems were frankly told.

Roy Bevan

Principal addresses—Part of the address of J. F. Gensley Jr. is to be found on page 98. He also discussed business conditions and advised not to sell America short.

O. R. Doerr gave highly encouraging information relative to the future of the electrical business and its tremendous possibilities to growth and of profit.

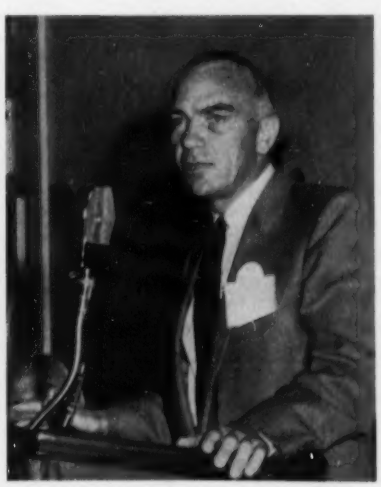
W. G. Paul likewise analyzed the business situation and showed that despite slight setbacks adjustments were being made and the future was bright.

I. W. Borda asked the cooperation of the various branches of the industry to develop the potentials in business opportunities before it.

W. O. Kyte linked the significance of Light's Diamond Jubilee to the industry's prospects of the future and told of many promising developments still to come.

James Tuttle stirred the imagination with the future possibilities of television and electronics.

Stanck Ginochio Abraham



Jack Kiedaisch

Sell the Risk Out of Credit

J. F. Gensley Jr.*

Assistant Vice-President, Bank of America
Los Angeles

Gensley

There is nothing mysterious about consumer credit. A few fundamentals with a common-sense application of them will make anyone practically an expert.

Proper selling is the first. Don't overlook that point. There is no shorter cut to disaster than unethical selling on an installment basis. A purchaser rarely blames himself for what he thinks is a bad deal. He expects, and rightly so, that the salesperson knows his product. He also expects, again rightly so, that the salesman will not misrepresent the transaction.

A dissatisfied purchaser will not make the extra adjustments needed when his payment schedule gets rough. When he gets crimped for funds the first thing that goes is the one he likes the least.

Next in line comes the purchaser's income and its relationship to expenses and other obligations. I can't give you any yardstick, as a matter of fact you can't really use one. If you try to apply a uniform schedule to all of your installment sales you will lose sales but you won't lose losses.

Each credit application must be individually considered. When doing so, be sure to remember this—all of the prospect's payments when added up including those for your sale, when deducted from income, must leave sufficient for food, clothing and shelter for the buyer and his dependents with a fair margin to spare.

Remember also there is no substitute for permanency of income. A recent analysis of a group of defaulted accounts showed 67% of the purchasers had continuous employment of less than a year's duration.

You must consider, too, the relative necessity of the article to be financed. It is quite obvious a purchaser will make more effort to continue payments on an automobile or a household essential than he would on a fur coat purchased for an ex-girl friend.

Check your prospect's paying habits. There will be no more reason for him to pay you than to pay anyone else.

In addition, there are two other factors to consider: terms and collections.

Lending agencies generally seem to have standardized terms within certain limits. Variations are largely by type of institution.

Installment sales terms should be considered as an aid to sales. They should never be used as a substitute for the merits of a product or for salesmanship. Installment credit is not even a reasonable substitute for a give-away program. Lenders are a peculiar bunch. They want their money back with interest.

Equally as bad is going to the other extreme. If terms are to be so severe that a down payment and short maturity are to be substituted for good credit judgment, you might just as well go on a cash basis.

To sum it up, installment sales terms should be used only as an adjunct to a sale properly made, one where the buyer would freely have paid cash if he were able.

Here is a bit of advice for those who sell on credit. Compete in sales, compete in service, compete in credit—but do not compete in liberality of credit. You sell your merchandise, let your competitor give it away if he wants to.

A sale is not a sale unless the merchandise remains sold. On a cash basis it remains sold unless the buyer is dissatisfied. That can be either real dissatisfaction or just buyer's remorse.

Collection is Like Selling

Where an installment sale is involved you have an additional factor, failure to pay. That means collection problems. If you are selling on credit as a regular part of your business and you have no collection problems go out and get some. If you don't you are losing a goodly portion of your sales potential. I am not contradicting what I said earlier: "Don't compete in liberality of credit."

Liberal credit will give you more than problems, it will place you in a very unfortunate position. Tight credit will eliminate your collection problems along with a disproportionate volume of sales. Realistic sales credit will give you a normal volume of delinquent accounts. There is nothing wrong with that, providing you follow your collections with the same enthusiasm as you do your sales.

Here again no definite formula will apply in every case. Each delinquent account is as much a personality as the person behind it. There are, however, certain fundamentals to be considered.

First eliminate those who can pay but have either overlooked it or are one of those who seem to like to be reminded. A courteous routine contact, usually a form notice, will be sufficient. Don't hesitate to use the phone, but be diplomatic.

Those remaining after that are problems. A solution of each will be much easier if you can find the reason for nonpayment. The earlier you can find it, the more successful you will be.

If the reason is dissatisfaction, correct it if you can. That can be by exchange, adjustment or, in many cases, by just really completing the sale. Frequently you will find that the buyer was not completely sold in the first place. He just didn't know how to say "no." Detect the weak spot in your first sales effort and sell him over again.

If the buyer is just a "dead beat" you're on your own. You probably will have to apply the old maxim: "All's fair in love, war and collecting bad debts."

You will find that the great ma-

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* Extracted from the talk presented at Business Development Section, PCEA, regional meetings at Long Beach, San Bernardino, Santa Barbara and San Diego in March and April.

"In the field of banking we have a wonderful opportunity to see the inner workings of all kinds of business. We see the causes of success—and also the causes of failure. We do not invent these things. Our information comes from you and others just like you."

jority of defaulted contract purchasers are that way only because they are up against it. That is particularly true right now where so many workers predicated their monthly payments on overtime-loaded pay checks.

Where the will to pay is there, even though the present ability is lacking, a reasonable extension is the best answer.

Up to a point, collecting is just like selling. Be consistent, be aggressive, be polite and diplomatic. Get your sales pitch across and keep ahead of your competitor — he also may be looking for money. Be firm but understanding.

When you get beyond the point where collecting is just like selling, you will have to remember what I said when I mentioned love and war.

During any economic readjustment, such as we appear now to be having, defaults will rise somewhat. This need not be an alarming situation. As a matter of fact, it can be quite a natural thing. If your selling has been proper, if your merchandise is reliable, if your credit consideration has been realistic, you will come out all right.

Four Rules to Watch

In any normal market, good merchandising requires adherence to four cardinal points.

The first is that **any product in stock must do what it is represented to do.** It must do that in a manner comparable to competition.

Second, **it must be priced right,** priced right not only from a competitive viewpoint but from a utility viewpoint. A fully automatic kitchen range, with built-in lifetime atomic power, if priced at $5,000 would not affect the present day sales of electric ranges priced at the equivalent of a month's pay.

Third, and very important, is that **the price at which you can sell any merchandise must include a reasonable profit for you.** If you don't have a sufficient markup to allow you a reasonable profit, you are in effect giving away part of your business.

Now for the last. It is the real key to merchandising. **Each product you handle must fill a current general public need** in a manner pleasing to the consumer.

If you have in stock any merchandise that does not match up to those four principles, get rid of it as soon as possible.

In any business involving commodities, inventory control is a critical matter. Too often this is entirely overlooked by the small business man. He feels he can trust to memory or to his constant visual contact with his premises. That is a dangerous attitude. Inventory problems contribute very heavily to business failures.

As long as merchandise remains on the shelves it loses money for you. The longer you hold it, the greater the loss. Of course, some of it has to be there for a time. But the shorter the time the better, unless you're aging whiskey.

You don't move merchandise yourself. Buyers do it for you. However, you have to show them. That is salesmanship.

Evelyn Hansen is McCall Award Winner

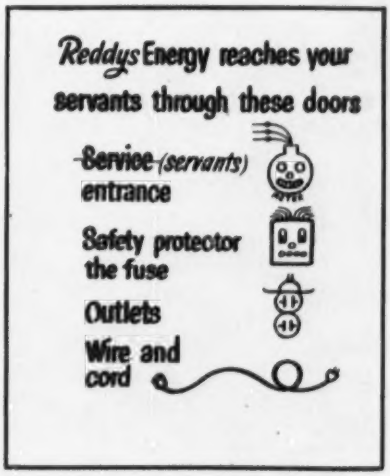
For the second time in three years Evelyn Hansen, home service director for Utah Power & Light Co., was the winner of a McCall Award for "outstanding contribution to the advancement of electrical living." It was presented to her April 7 at the Edison Electric Institute annual sales conference in Chicago.

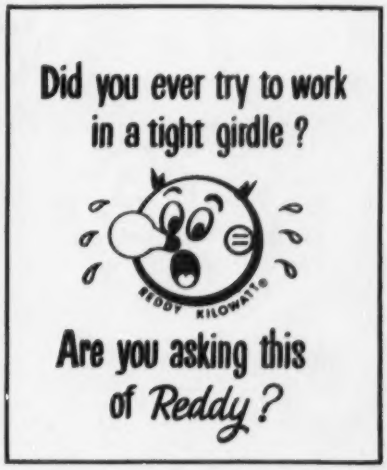
The award was given for the clever cartoon card presentation that the home economists of Utah Power & Light have been using to tell the need for adequate home wiring. These have been presented to homemaking classes in the schools, to women's groups and in cooking schools and TV electrical living broadcasts.

"Reddy Kilowatt, your electric servant," is employed to illustrate the ideas pictured on eight cards that are mounted on an easel carried by the home economist to a meeting. Using comparisons that are easy to appreciate, the story starts with the service entrance, which it calls the "servant's entrance," the fuses that are called "safety protectors," and the outlets, wire and cord. It reminds that there are 100 different helpers to provide for. Doors that are too small hamper Reddy. "Did you ever try to work in a tight girdle or walk in tight shoes?" is a telling reason that no woman can fail to understand. It ends with advice to modernize the wiring and to call an electrical contractor.

The whole thing takes only 10 minutes and yet gets over a compelling idea in a practical way. The presentation is also given to dealer and contractor meetings and all have expressed delight with it. In all, some 600 hear and see the message each month.

This type of presentation fits with Sales Manager W. A. Huckins' pictorial presentation this year of the entire sales development program of UP &L. Another program to be launched in May is one on lighting. Details of this have not been announced but it is known the lighting engineers of the lamp companies will each present demonstrations of new lamps and lighting equipment to industry-wide audiences.





Two of eight cards used by UP&L home economists to tell women about home wiring

After circulating among the appliance and air conditioning displays the crowds gathered at the stage for door prize drawings

Contractors were selling adequate wiring for home installation

Westinghouse showed the Precipitron and heat pump for homes

Weather, Appliances Feature Phoenix Show

Timed to the first hot weather, the fourth annual spring appliance and air conditioning show of the Phoenix Appliance Merchandisers Assn. gave a spurt to sales that promises to keep them on a higher level for the rest of the spring and summer. It drew about 11,000 for the three-day showing. There were 72 exhibitors occupying two buildings of the state fair grounds. A teaser "peep show" at the entrance gave those who peeped sights of ancient appliances, water pumps, coal oil lamps, coal stoves to remind viewers of the contrast with modern electrical comfort-bringing appliances. Added attractions were stage shows, 96 door prizes, a concurrent flower show in another building adjacent. Although major emphasis was on air conditioning or cooling equipment the strictly white goods exhibits had good play too. It was a manufacturer and distributors' show, with assistance in manning the displays by the dealers who used the contacts to get prospects and make sales. Reports of satisfaction were heard from dealers and distributors from the show. Among new things shown were heat pump air conditioners, automobile coolers, home package Precipitrons, improved controls for cooling equipment, new models of window air conditioning units. Spring fair committee was headed by Millard Smith, Westinghouse Electric Supply, and L. C. Mead, L. C. Mead Firestone Co. George Cornforth, AMA president, was particularly active.

AMA manager Bill Johnson and President George Cornforth ran the big promotion

ELECTRICAL WEST Sales Guide

News Letter

May 1954

FOR THE ELECTRICAL MERCHANT OF THE WEST

With business about the same as last year in most parts of the West it looks as if the months ahead will follow the forgotten normal pattern of prewar days. For those who weren't in the business then, there was a spring upturn, a summer good for refrigeration kinds of business, a rising radio and TV business in the fall and housewares for Christmas. It has even been plotted on curves to guide you in timing your drives.

Back to normal

Discount houses are folding faster than other types of dealers, some recent Dun & Bradstreet records show. What is also hurting some of the manufacturers that were so free with the franchises is that the better substantial dealers are not promoting their wares. They do not care to advertise and display to act as showrooms for discount brokers.

Folding faster

Kelvinator is said to be refranchising and being more selective about it. Sylvania has already done so on TV. Another major TV maker is about to do so. The trend is to tighten up the loose distribution so prevalent and to work more with promotional-type active dealers.

More selective

Northern California Electrical Bureau attributes the fizzle of its TV sales promotion with an excellent slogan: "The air is full of things you can't afford to miss. TV is a terrific value today" to this: Sets selling today are in the promotional low brackets on which there is little or no cooperative advertising so dealers did not back up the campaign much. Likewise did not feel like advertising for the discount houses to make the sales.

Why it fizzled

San Diego's bigger than ever Spring Fair, however, seemed to loosen the change that was in ample supply in San Diegans' pockets. They just needed some urge to buy. The show, seen by 155,000 people, generated that urge. "Exhibitors generally were surprised over the enthusiastic attention given to white goods of all types, including kitchens," says J. Clark Chamberlain, Bureau of Home Appliances manager.

Needed urge

"Tell us how you do it" that bureau's president, Bob Halvorson, was asked to tell at the Rocky Mountain Electrical League spring conference in Denver May 3-4. He described the San Diego bureau's programs and how dealers take advantage of them to make sales.

Told how

A financing plan whereby a dealer's customers may pay for the special wiring required (plumbing too) for dryers, ranges, water heaters, air conditioners, was just offered dealers and contractors of Arizona by Arizona Public Service Co. in a series of meetings. (See next issue.)

Financing plan

Prices reflected the cut in excise taxes wherever these applied. However, radio, television and some others were not included. Indeed, price increase was announced by Emerson on two TV models. . . The reductions caused some painful loss taking on part of dealers with stocks on which higher wholesale had been paid. Reductions were small in most cases. In others evidently the manufacturers combined a price drop. Servel dropped refrigerator and water heater prices substantially. — Up and down

Sears, Roebuck in its midspring catalog listed many price reductions in the appliance field, the dishwasher taking the biggest cut. . . Other manufacturers also seemed to be aiming at a lower price market. Westinghouse brought out a simplified Laundromat Twins pair at considerable reduction. . . Canada likewise repealed its 15% excise on quite a number of appliances. — Prices cut

Discount houses in Los Angeles, harassed by fair trade suits, are said to be organizing an association. They can't make up their minds whether to try to repeal fair trade or continue to ride under and face legal action. — Can't decide

Watch Norge! Jud S. Sayre, who made Bendix home appliances, left Avco, where he had been made a vice-president, to become president and general manager of Norge. George P. F. Smith, former president, moves up into the executive staff. — Move up

"No future in ironers" was the opinion of Fred Maytag to the Security Analysts in New York. Mort Farr, Upper Darby dealer and former NARDA president, took issue. — No future

Absorption of L & H by Thermador first brought announcement of merging of the sales staffs of both into one organization with Frank A. Ballman as general sales manager of Norris-Thermador Corp. Jack A. Plano, former gsm of L & H, becomes eastern sales manager with headquarters at the L & H plant in Milwaukee. First announcement that all products would be marketed under the Thermador was changed. L & H Custom-Bilt line of electric cooking tops and ovens, made in Milwaukee, will continue with the L & H name. Anthony Celio, former Utah, Colorado and northern California L & H manager, becomes advertising and sales promotion manager for Norris-Thermador, Los Angeles. Richard F. Page is manager of electric heater sales, James P. McMahon southern California district manager of all consumer products. — Staffs merge

Fair trade injunctions in Fresno have been granted against Rex Television City in a suit by Devlin-Drew Co., Philco distributor. . . Jay Broiler Co. announced it would fair trade its Roto-Broil No. 400 series line. . . G-E has been filing injunction suits against the so-called "Consumers Guild" group in Los Angeles. . . National action to further strengthen the fair trade laws has been initiated by several retail associations. Action to have fair trade passed in Washington, D. C., is also under way. — Fair trade

Another home-lighting workshop will be held in San Francisco at the State College June 28 to July 2, offering college credits. Co-sponsors are Northern California Electrical Bureau and IES. Mary Webber, G-E, Edith Buchholtz, Westinghouse, Jan Reynolds, Sylvania, and Edward A. Campbell, manager, Better Light--Better Sight Bureau, are programmed. Dr. Gertrude Luehning, San Francisco State College, is in charge. . . This will precede the American Home Economics Assn. annual meeting July 6-9 at San Francisco's Civic Auditorium, with a big exhibit in connection. — Lighting workshop

Being pushed

Color TV seems to need considerable push to make any sales. At prices beginning at $1,000 up, even with merchandise available and some excellent programs each week, the buyers are scarce. . . RCA put models on the market last month. So did Westinghouse. Both doing considerable advertising. Denver, Salt Lake City, Los Angeles, San Francisco and Oakland were the markets introduced. . . Tube sizes are going up, the Chromatic or Lawrence tube, being made in 21-in. size. . . Dr. W. R. G. Baker, G-E TV expert, told the Electric Club of Los Angeles that introducing color under public noise had been premature. It was technologically unready.

Radio-TV news

Westinghouse will close its Sunbury plant making TV to consolidate all production at Metuchen, N. J. . . RETMA reports first quarter radio-TV production at about the same level as in the 1953 period. . . Meanwhile Los Angeles Electric League figures report an upturn in sales of 32% in March over February and higher than March 1953.

Had you heard?

North Pacific Supply Co., Portland, RCA Victor distributor, won the Oregon Advertising Club's 1953 certificate of Highest Merit for one of the best general advertising campaigns in the under $15,000 budget bracket. . . Graybar has been made distributor of a new line of industrial TV equipment to be made by Diamond Power Specialty Corp. of Lancaster, Ohio. . . E. E. Pritchett, Salt Lake City, will distribute Arvin radio and TV. . . Wholesale Supply Co., Portland, is a new distributor for Emerson Radio & Phonograph Corp. . . Tubbs Electric in Spokane has taken over the Hallicrafters line again.

More changes

New distributors for Deepfreeze are North Coast Electric Co. in Portland and the Carlos W. Stone Co. in Salt Lake. . . Horn & Cox will distribute the Roto-Broil rotisserie-broiler line in southern California. . . Sues, Young & Brown is now handling Ironrite products in southern California. . . . Edco Distributing Co., Fresno, Calif., has taken over the Whirlpool line. . . In Hawaii Trading Center has been made exclusive Kelvinator home appliance dealer on Oahu. First showing of the 1954 line was at the opening of Trading Center's third store, in downtown Honolulu. Partners William Stone and Paul Moreland started the chain in 1946 in a garage. . . Hawaiian Wholesale Food Plan is wholesale distributor for Deepfreeze home freezers and a branch of the National Co-Operative Freezer Food Service, according to Mortimer J. Glueck, president.

About people

G. G. "Chuck" Winston, Westinghouse Appliance Division factory representative at Los Angeles, has been made Pacific Coast regional manager of refrigeration specialties. Walter F. Schanz will be Pacific Coast regional service manager for Westinghouse appliances. Both men will headquarter in San Francisco. . . J. H. Shoemaker is representing G-E in home heating and cooling equipment sales in northern California, Arizona and Nevada. His headquarters are in San Francisco. . . Louis D. Stull, formerly Apex Western manager, is now West Coast district sales representative for Republic Steel Kitchens. . . D. A. Siolseth of Seattle recently became Northwest zone manager for Bendix Home Laundry Division of Avco. . . H. K. Churchill, formerly with Sues, Young & Brown, is now West Coast district manager for Vornado products. . . Frank C. Porter has been made sales manager of appliances, radio and TV for Columbia Electric & Mfg. Co., Spokane. He was v-p and g-m of the F. B. Connelly Co., Portland. . . After 45 years in electrical wholesaling, Dan U. Chamberlin, co-owner of Globe Electric Co., Seattle, has retired. . . . Winners of 1954 Fords in a sales contest sponsored by Whirlpool are James D. Swenson, Prudential Distributors, Spokane; Pete Mustavich, Graybar, Los Angeles. . . Frank P. Fern, formerly in Los Angeles, will head Hoffman Sales Corp. of Seattle.

The discarded refrigerator elimination drive, started in the West, has become national. NEMA is promoting a nation-wide drive June 6-14. — Started in West

A financing plan for the wiring required to install heavy-duty appliances is now in force in Arizona Public Service Co. and Portland General Electric Co. territories. Pacific Gas and Electric and the Northern California Electrical Bureau are preparing a similar plan. They are all similar to the Cincinnati plan, with differences in detail. Watch for stories in the future. — Wiring plan

Pulling no punches, Imperial Irrigation District is advertising "It's flameless" in its range and water heater ads. The district has a $35 wiring reimbursement and $20 on water heaters, even on houses just being built. It also serves three phase for air conditioning in all urban areas where required. — No punches pulled

A show is being talked up as a companion to the Northwest Appliance & Television Assn.'s Profit Clinic scheduled for September. . . The sixth Western Houseware Show is scheduled at Los Angeles Biltmore and Shrine Exposition Hall, Los Angeles, Aug. 2-6. . . The Gift Show of the Western Merchandise Exhibitors Assn. in San Francisco is presumably on the same dates. — Shows coming

Operation Jet is the name Puget Sound Power & Light gives its back-to-action sales campaign in 1954. A training school was run for rusty sales personnel in January and the program got off the ground March 1. — Jet drive

Cherry Blossom Festival was made the occasion for a special cooking school by the Electrical Living Committee of PCEA in the Hawaiian Electric territory. A skit, "Enjoy the Difference!," starred Hortense Clifford, home economist. A feature of the festival was a home economist from Japan, Dr. Ava Kagawa, who demonstrated Japanese cookery to a record-breaking crowd of Japanese Hawaiians at the company auditorium. . . . The campaign among dealers is for electric dishwasher, sink and garbage disposer units with financing under Title 1 FHA loans. Both Bank of Hawaii and Bishop National Bank are cooperating. — Cooking school

Sacramento Valley Electric League is readying for the third annual electric home show at the Memorial Auditorium May 20-23. More exhibits and a big entertainment program are the drawing cards. The league's "I Want an Electric Range" contest continues to May 26 and is reported to be bringing results to the dealers. — Home show

Frank A. Tool becomes manager of the Inland Empire Electrical League as Bob Wilkinson resigned to devote full time to the NECA in Spokane. Tool has been dealer sales coordinator for Washington Water Power and secretary of the league. He is assisted by Melvin Dahlberg, who has been field man since last August. The league's "Winter Sunshine" sales campaign went over the top with 6373 units of washers, ironers, dryers and heaters sold, 146% of quota for the three months. This included 1,544 automatic washers, 1,062 conventional units, 1,124 dryers. Ironers only were below quota. Newest campaign is called "Lucky Lady," with quotas of 3,000 ranges, 1,915 water heaters, 300 dishwashers and 150 disposers during April, May and June. All sales made by dealers. — New manager

New addresses: State Equipment & Supply Co., refrigeration parts wholesaler, 416 S. 7th Ave., Phoenix. . . United Western Distributors (Coolerator, Hamilton laundry equipment), 4494 E. 49th, Vernon, Calif. . . Campbell Bros., service station for Bersted and Eskimo-Fostoria appliances, Zero and Eskimo fans, 657 Mission St., San Francisco. — Moves

Frigidaire's Kitchen of Tomorrow at the General Motors Motorama is made in units

W. I. Buchanan, H. F. Lehman anticipate

Harley Earl, G-M's styling vice-president, tells the why

Bill Baldwin, Verna Miller and Oakland's Betty Smith

"Kitchen of Tomorrow" Soon Available

Significant thing about Frigidaire's "Kitchen of Tomorrow" is that it is nearer reality than it is to just a dream. As the General Motors Motorama itself, with its dream cars, the purpose was to test public reaction and thus help decide when and what to introduce in next year's program.

Opportunity to see this well-designed kitchen was presented to the crowds in both Los Angeles and San Francisco who visited the Motorama. Although tucked off into a corner some 75,000 saw it and heard its concentrated five-minute pitch in Los Angeles, some 25,000 in San Francisco. In addition the home economists and press were given special previews.

Accompanying the Motorama were Mason M. Roberts, vice-president, who is Frigidaire general manager; H. F. Lehman, general sales manager; Harley J. Earl, GM vice-president in charge of styling whose dream the kitchen is, and Verna Miller, director of home economics. W. I. Buchanan, Western regional manager, Frigidaire Sales Corp., and local staff aided in the presentations.

Built in modular sections, almost everything in the kitchen could be manufactured and marketed in such packages. The electric oven was not operational but even that could be manufactured and sold.

The departures from present-day appliance design that have particular convenience appeal were many. The range oven, for instance, instead of being mounted in a wall at waist height, was in a counter-height base cabinet but, with push-button control, was elevated to counter-top height to load and unload. While cooking it was lowered to below the counter. Both refrigerator and separate freezer had double-panel fronts either half of which was raised or lowered by push button. The interior was at waist height. The doors thus slid up or down and did not open into the room. Likewise the kitchen cabinets above the counter at the wave of a hand moved downward within easy reach and back again out of the way.

Ice cubes, crushed ice or ice water came from a separate unit near the counter to the dining area.

There were numerous other control niceties also. Fundamentally, though, the real innovation was the provisions to bring all kitchen tasks at a comfortable height without reaching, stooping or stretching. Perhaps next year some will be in production.

Coughlan Brass

Moulton Gros

PCEA and PCGA Exchange Know How

Informal discussions give Administrative Services Section opportunity to review current practices in light of common experience; to determine where traditional procedures have become cumbersome

Exchange of ideas on job techniques again played the major role at the joint meeting of the Pacific Coast Electrical Assn.'s Administrative Services Section and the Pacific Coast Gas Assn.'s. Accounting Section at Hotel Claremont in Berkeley, April 7 and 8. Some 150 attended the sessions, arranged for four groups in the section. The other four met in Hollywood last November.

George Coughlan Jr. and John Brass Jr., both of Pacific Gas and Electric Co., are co-chairmen and J. T. McNab, Arizona Public Service Co., is vice-chairman of joint activities.

The section met in parallel discussion groups during the mornings and afternoons, with all joining at the two luncheons to hear pertinent talks by industry speakers.

The Pacific Coast has been growing at a rate of 600,000 per year and, even allowing for some slackening, yearly average growth is not likely to drop below 500,000 through 1960, Marion E. Dice, manager, economics department, General Petroleum Corp., predicted in his Wednesday luncheon talk, "Energy Sources for Continued West Coast Growth."

If these new people were to settle in one place, it would mean a new city the size of Oakland plus Richmond each year, or a new Santa Barbara every month for the next seven years, he pointed out.

In the Pacific Coast states primary sources of energy for all uses, including transportation, are oil and gas, 91%; hydroelectric power, 5%; coal, wood and other fuels, 4%, he stated.

Average annual energy requirement for each man, woman and child in the West is 23 bbl of gasoline and fuel oils, 50,000 cu ft of natural gas, 3,750 kwh of electricity (of which 3,000 kwh are from water power), 1/6 ton of coal, 1/4 cord of wood. These are averages, he emphasized, and include all fuels used by industry and various forms of transportation, as well as by individuals directly. The total equals 201,000,000 Btu per person per year, 18% less than the national average, he said.

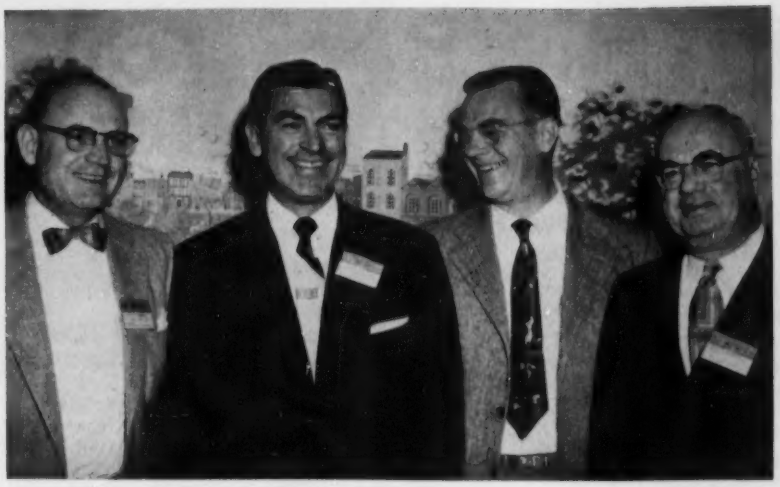
If these energy requirements continue to grow in proportion to population and water power continues to supply its share, if natural gas continues to come from other areas in present quantities, the 1960 oil requirement will be about 1,300,000 bbl per day, 186,000 more than the 1953 demand, he predicted. Any additional gas from outside sources will reduce this oil requirement, he pointed out.

As to where the oil will come from, he reminded that there are many possible sources competing or ready to compete. He pointed to California reserves, discovered and undiscovered; Nevada, a new source, promising but unproved; a large pipe line movement of Colorado and Wyoming oil through Salt Lake City; a new pipe line being built from Montana to eastern Washington; the new Trans-Mountain line from Alberta to the Pacific Northwest. All these will have competition, he declared, because there is oil available from every surplus area of the world, obtainable by tanker at reasonable cost when needed.

With outlook for energy supplies good, the large user need only concern himself with two questions, Dice thinks. These are: (1) are world-wide supplies ample; (2) are prices here likely to fluctuate in step with world prices, protecting against the penalty of a disproportionate price rise and giving the benefit of any general world-wide price decline? The answer to both these questions is "Yes," according to Dice.

The user can transfer his worry, he declared, if he lets his requirements become part of the forward planning of a supplier who can take advantage

" . . . the 1960 oil requirement will be about 1,300,000 bbl per day . . . "



McNab Kelly Liecty McGann

" . . . those in business and advertising must work and sell harder . . . "

of: (1) manufacturing flexibility, with the customer's fuel requirements firmly included in future output; (2) flexibility to draw upon various alternative sources of raw material so that continuity of supply at competitive costs may be assured regardless of unexpected fluctuations in more localized supply and demand.

Such planning is the best way to assure a utility that its primary energy needs will be met and to enable the supplier to take the necessary risks, he said.

Confidence in a continued high level of business activity, in which advertising will play a vital role, was expressed by Robert R. Gros, PG and E advertising and publicity manager, in Thursday's luncheon talk, "Where Do We Go From Here?"

An over-publicized, over-emphasized recession has failed to develop from the present anticipated business readjustment, he declared, adding that he is not among those apostles of despair, cynicism and pessimism who are trying to talk the nation into a depression. He predicted that 1954 will end up as the second best year in American economic history.

An era of hard selling is here, however, he warned, pointing to advertising as a force that can keep production high by stimulating consumption.

Stating that his optimism has been reinforced by fact-finding on three trips to Washington, D. C., since the change of administration, he commended the new look in Washington and the new spirit toward business.

"The administration is trying the great experiment of applying to government the sound principles of business management, while giving American free enterprise an even break," he said. President Eisenhower had told him that he preferred the term "incentive economy" to "free enterprise," Gros added.

American production is the envy of the modern world but it is not itself the real goal, he declared. "The real goal and the master of our economy is consumption—sale of goods to the ultimate consumer. Mass production can't exist without mass consumption. And mass consumption can't be attained without mass selling, which is advertising."

American production workers are among the frontline troops in the world struggle for human liberty, Gros believes. He is convinced that the essence of today's crisis is the struggle of the individual against the forces of collective tyranny and that advertising is a written, spoken expression of individualism because it relies on persuasion to voluntary action—not on compulsion.

Declaring that those in business and advertising must work and sell harder, he urged that we "plan for the potential miracles of tomorrow with a confidence born of the solid accomplishments of the past."

Internal Auditing

I. L. Comstock, Coast Counties G&E Sponsor

From questionnaires sent out before the meeting, it was determined that all but two of the smaller companies have regularly established internal auditing departments, number of employees ranging from one to 37. Of the 13 companies reporting, eight do not divide their internal auditing into components.

Most companies audit all phases of district and division office work, at least the accounting functions. There was wide variance as to general office operations that are audited by the internal auditing staffs. In only three companies did the internal auditing departments report no restrictions in scope of their activities. It was apparent that several company managements consider the auditing of the general offices to be the sole prerogative of the outside auditors. It was agreed that the ideal situation is for internal auditing staffs to so inspire management confidence that any function can be included in its program.

With about half auditing the purchasing department, all present believed that this part of the organization should be more fully audited on an internal basis. Operating department auditing is a phase that few internal auditing departments have ventured into to any extent. All delegates realized that this is an excellent field for development and is definitely an integral part of management internal auditing.

It was agreed that all internal auditing staffs are trying to cooperate with the outside auditors, and are successful in varying degrees. It was brought out that the complete job of auditing any organization is done by both inside and outside groups and that, if the outside auditors have sufficent confidence in the internal auditors, they will usually confine themselves mainly to balance sheet items.

Practically everyone attending the session was more or less satisfied with the format of present audit reports. Standardization was declared not feasible at present because reports must be geared to requirements of management.

The majority reported at least a spot check of materials and supplies by internal auditors.

The internal auditing organization of Standard Oil Co. of California, which fits the Institute of Internal Auditors' pattern for the perfect structure, was outlined by L. E. Bennett, the company's general auditor. The department consists of a general auditor, two assistants and 24 traveling auditors; has functional guidance over 55 other local employees who operate at the field level. Approximately 80 different audits are made each year.

It was agreed that advance planning of audit programs is desirable. Primary objectives are assurance of proper coverage, satisfactory job performance in conducting the audits and control of the time spent in completing them. A successful program

" . . . internal auditing should be a supplement, not a substitute for external auditing . . . "

was described as one that does not concentrate on a particular phase but covers many functions and is patterned to best furnish the information management needs.

Advantages claimed for a planned audit program: (1) informs management as to the phases of the operations to be audited; (2) informs outside auditors of the extent of the internal coverage, eliminating duplication; (3) assists the internal auditor in arranging his work schedule; (4) helps in estimating cost of the program before it is started.

Primary responsibility for a sound system of accounts and recordings rests upon accounting management, Benton C. Coit, Haskins and Sells partner, declared in his talk on cooperation between external and internal staffs. The external auditor is interested in seeing that the internal control, established by management, is functioning properly, he continued. The public accountant bases his examination on the extent of the internal control system; if it is good, he reduces his tests, Coit said.

Expressing the belief that work of the internal auditing staff should be considered as a supplement to and not a substitute for the work of the independent accountant, he said that nevertheless opportunities for cooperation between the two are becoming increasingly common. Ideal cooperation demands correct organization and in this, Coit said, it should be remembered that internal auditing is a staff or advisory function rather than a line operating function. The staff must be an independent organization, he believes.

Stating that he objects to joint examinations, Coit said that he believes both auditors should act independently but should coordinate their work so that it will be performed at the lowest possible cost.

Where the internal audit program goes beyond the verification type and becomes functional in that it provides service and advice to management, these suggestions were given: (1) the more authority that management delegates, the more intensive the audit program should be; (2) use man-hours rather than dollar amounts as a yardstick when making special analyses; (3) establish standards of performance for clerical operations; (4) be practical when conducting audits; recognize the human factor; (5) don't criticize without making constructive suggestions for improvement; (6) select a limited number of operations for intensive audit each year.

Audit reports fall into three categories, it was pointed out. They are oral, preprinted or check off, written. It was agreed that oral reports lead to inaccuracies and misinterpretations; that check off reports contain too much detail that is of little interest to management and should be considered part of the audit working papers; that written reports probably are the most effective and that a good one should contain: (1) scope of the audit; (2) existence of faulty conditions previously reported; (3) present findings requiring corrective action.

All findings should be discussed with the supervisor under audit before the report is written, it was suggested. The language of the report should be clear, factual and concise; the report should be courteous and tactful to insure a friendly atmosphere on future trips and help sell the auditor's ideas; it should be professional in appearance, typed on good quality paper and bound in an attractive cover, were other suggestions made.

Accounts Payable Practices and Procedures

Neal J. Blaney, So. Calif. Gas Sponsor

That no two companies do accounts payable work in exactly the same way was brought out by the small but representative group that attended these sessions. All participated in the informal and spirited discussion.

Purchase approval requirements are similar, with considerable variation for large purchases. All companies but one use what might be termed a material received report, usually prepared by the receiving employee.

For accounting distribution, several companies use tabulating equipment, one uses National Cash Register bookkeeping machines and the rest post manually. For all except one, accounting distribution is centralized in the accounting department. A folder or voucher jacket or "back-up card" seems to be in general use as a permanent filing medium. One company microfilms, then destroys accounts payable documents after several years.

Most companies prepare voucher checks by typewriter. One uses NCR equipment. One uses prenumbered checks with a typewritten copy for a check register. All use check copies for alphabetical reference. On the remittance statement portion of the check, one company shows only the amount billed; others give some description.

All companies perform a prepayment audit but its extent and the departments responsible vary. In some cases verification of prices, invoice extensions and additions are done by purchasing or stores departments; in others by the accounting department.

One company pays invoices of less than $75 as billed, with no verification except comparison of invoice with purchase order. Another does this with invoices of less than $50 but compares them with a receiving document as well as a purchase order. It is estimated by the two companies that these small invoices represent more than half the total paid each month.

Another company materially reduced its month-end peak by scheduling invoice payments on a due-date basis at the time of audit. Post-payment audits are not handled by accounts payable personnel in any company but are generally done intermittently by internal audit staffs.

All but one company verify utility invoices by rate chart extensions of consumption. One merely compares for reasonableness the charge for the current month with that of the same month the year before.

One company avoids considerable work by limiting personal use of telephones to supervisory personnel, making public telephones available to others. Another charges all utility bills to general and administrative accounts.

The majority pay small public carrier invoices through petty cash or individual funds. In one company all such invoices are paid by accounts payable. Three employ a freight audit service, which receives half of the freight claims settled. One has a freight traffic expert as an employee.

All companies apply trade discounts to reducing cost of materials. Two use cash discounts for reducing costs through clearing accounting. The others use cash discount as a reduction of materials costs. To keep cash discount payments from being delayed beyond the due date, one company charges a suspense account with the invoice cost and clears the account when all related documents have been received.

Reimbursement of employee expenses varies. One company reimburses expenses under $10 by cash. Another uses petty cash funds to reimburse all personal expenses. The rest reimburse through voucher payments from general funds.

Four of the companies use fiscal instead of calendar months for accounting distribution of personal expenses. One reports such expenses as taxable income to federal and state governments and employees are expected to treat such items as business deductions

Comstock Noe

Charonnat Blaney Fairlee

on their individual tax returns.

Transportation for employees on business trips usually is obtained through a traffic employee and is paid by the company.

All companies tend to discourage preparation of statements by vendors but have occasional use for such statements for difficult reconciliations. Two companies use vendors' statements when convenient for facilitating preparations of the check's remittance statement.

Except for power and gas purchases, as well as for liabilities of large amounts, only three companies record relatively small liabilities through accrual methods.

Contract Procedure
Formulation and Administration

E. V. Noe, PG and E
Sponsor

Although opinions varied on the most effective course to follow, the least possible construction cost consistent with public relations and service seemed to be the aim of all who took part in the informal, lively and well-attended round-table discussion presented by this section.

The presence of well-qualified representatives from legal, engineering, construction, purchasing and other interested departments led to a comprehensive examination of the problems attending contract operations.

Except for minor deviations, procedure of the various companies in handling contracts, whether under the guise of a purchase order, short form, formal or proposal type, was similar. The dollar limit above which a formal contract is used varied from $2,000 to $300,000.

One major utility uses several types of short-form contracts, choice depending on the amount and on insurance requirements of each job. Two companies represented require the signature of an executive officer for all contracts above $1,000 and $25,000 respectively, while a third executes all contracts in its purchasing department.

While in most firms specifications are originated and prepared by the engineering, construction and operating departments, preparation of contracts is handled by engineering, law or purchasing departments.

Organizational differences and availability of manpower accounts for the fact that some companies complete the execution of contracts before starting the work, others as late as two to four months after (in which case a letter of intent and award is issued prior to performance).

The group reviewed in detail some of the more sensitive aspects of contracts: insurance, claims and compensation. Many ideas were exchanged on lump-sum and cost-plus contracts, unit prices, guaranteed maximums, profit-sharing provisions, indemnity clauses and sales taxes. Such taxes are, in some instances, assessed on what amounts to the labor performed.

One major utility has made substantial savings in its new contractor's insurance program which, for work amounting to $50,000 or more, includes election by the company to provide the insurance for the contractor's operations. Rental vs acquisition of both small tools and heavy equipment was discussed, with technical and accounting problems and possible solutions.

Discussing the mechanics of effecting progress and final payments, the group exposed differences in invoice routing procedures, with resulting differences in promptness of payments to contractors. It was thought that improvement in the matter of paying contractors, particularly the smaller ones, should be worked out.

The practice of bonding contractors showed wide policy differences. Some companies bond all contractors for work above $10,000, others for all above $500,000 and for all demolition contracts. Still others doubt the necessity of bonding at all, claiming that careful selection of contractors is in itself better and cheaper insurance. One company stated that during the past 25 years in only three or four cases had a bonding company been required to complete a contract.

It is general practice for utilities represented to file completion notices only for large projects. One company, however, files for all projects.

The ever-present problem of limiting the number and amount of change orders to construction contracts was recognized. Although the amount currently averages only one to five per cent of the total value of most contracts, all were vitally interested in lowering the figure.

Billing and payment methods for construction work differ slightly but results are the same generally. Procedure varies from close auditing to spot checking on contractors' books. One company pays for material when it is delivered but the majority believe it better practice to pay when the material is in place.

On cost-plus jobs, all but one company allow full percentage fee to contractors for subcontract work. One company limits the fee to 5% for the larger projects.

Differences in procedure were found in construction specifications. One company uses a standard General Condition form for all jobs over $2,500. Another uses a brief form of conditions for small jobs and an expanded form for larger ones. It is recognized that the additional protection afforded by the expanded form may result in an increased bid price. All agreed that the best "General Conditions" utilities can have are good relations with the contractors.

Equipment purchase contracts and specifications showed both similarities and differences in procedure. Some utilities write all of their own purchase contracts; others accept some

manufacturers' contracts as submitted but rewrite others to include or modify clauses. More than one company has annual purchase contracts for certain types of equipment. Terms of payment vary. Some specify payment will be made net 30 days after receipt and acceptance; others make partial payment starting on shipment, completing on acceptance; others make progress payment during manufacture of heavy equipment.

Final payment on major equipment varies also, some companies making it before field test and acceptance, others after.

Escalation clauses, incorporated in sales policies, were discussed at length. It was the consensus that costs are becoming stabilized and, as a result, utilities are resisting open escalation clauses. It was pointed out that firm prices are not the most desirable provision for items requiring a long-term delivery; that a more practical policy would be to accept the price quoted as maximum, subject to downward adjustment.

Purchasing and Stores
Stores Accounting and Traffic Control
A. A. Charonnat, PG and E
Sponsor
W. N. Fairlee, PG and E
Presiding

Design of stores accounting should include both accounting and materials handling functions and should be a guide to material procurement, Dexter Stoner, Coast Counties G&E, said in a talk on mechanical and electrical accounting machines.

Suggesting that purchasing and stores men go to accounting people and say "this and this and this will be useful to me, what can you do for me," Stoner warned: But "before you do, be sure it *will* be useful . . . because it is a waste of money to go to the expense of preparing a report that is not used to advantage by the person who receives it."

A mechanical accounting system recently installed by the Consumers Power Co., Jackson, Mich., was presented. Stoner said that the system had reduced the materials and supplies investment $2,500,000 with no added costs in operation. It was also pointed out that this system provides the company with up-to-date information for stock control, purchasing, indication of inactive and obsolete materials and other data necessary to efficient operation of a stores system. Machines used in this system are IBM calculators and tabulators.

H. L. Beck, So. Calif. Gas, reported use of IBM equipment to record purchases, materials and supplies transac-

" . . . it is a waste to go to the expense of preparing a report that is not used . . . "

tions and to effect efficient stock control. His company prepares stock status reports that enable the substore personnel to order when necessary and to expedite outstanding orders when stocks fall below a minimum level.

Joseph W. Jones, So. Calif. Edison, told of the reports and records used by his company. Points of interest were forecasting of future requirements, preordering material for large construction jobs and supplying contractors building major installations for the company.

Inactive material items reports and emergency stock reports were discussed, as were these other reports used by both purchasing and stores departments: system balance, material transaction or value, summary of activities, surplus, system average price.

Douglas Thompson, B. C. Electric, gave examples of application of the Bruce Henderson ordering formula as applied to some 100 items of material. Analysis of stock balances under this formula indicated 50% of the company's investment was in 66 items, the other 50% in some 10,000 items. Application of the formula resulted in lower inventories, better supply and reduction in handling costs, he said. He pointed out that this formula could not be applied as an over-all ordering guide but must be used with discretion.

R. A. Kormel, PG and E, spoke on traffic management control. His discussion covered functions of the traffic bureau in preparing shipping guide, routing of purchase orders involving shipments over 10,000 lb, assistance to buyers as to proper methods of routing orders and passenger reservations.

Duties of the shipping department were reviewed with respect to consolidation of shipments and preparation of contracts with outside haulers and their function in an advisory capacity to substores and departments on economical routing of shipments not covered in the shipping guide.

In discussing approval and payment of freight bills, emphasis was placed on the need for close audit to prevent duplicate payment.

H. T. Letts, So. Calif. Edison, led a further discussion on traffic management and control. Major points covered: necessity of cooperation of all departments on traffic control; consideration of type of transportation before routing; control of all phases under one head; use of a traffic manager in negotiating with carriers, importance of communications with field on arrival time, unloading, etc., to reduce stand-time costs; bidding vs straight fee; coordination of traffic control permitting pooling of shipments, reduction in mileage, reduction in cost, eliminating duplication of equipment usage and reduction of fleet strength.

Arizona Public Service Co.'s method was presented as an example of good traffic control. All personnel trips, material movements and cancelations are routed through the traffic control supervisor for approval.

PCEA Uniform Code Approved

The 1953 edition of the Uniform Electrical Code has been approved by the Attorney General for adoption by reference for California cities and counties, and is now being distributed.

The Uniform Electrical Code offers cities and counties a vehicle through which they can economically and efficiently adopt the 1953 National Electrical Code to cover their official wiring requirements. Previous editions of the Uniform Electrical Code have been adopted by 137 cities, 14 counties, and 1 fire district in California. It is hoped that many of these will change over to the new edition in order to keep their electrical regulations up to date.

Victor W. Hartley, managing director of the PCEA, upon receiving notification that the Attorney General had approved the adoption of the code by reference in California said: "There is immeasurable value in the work of those who have helped in this activity because it results in a tremendous benefit to the building public as well as to the electrical industry."

• **AIEE** will hold its summer and Pacific general meeting at the Los Angeles Biltmore June 21-25, according to Bradley Cozzens, general chairman. On the committee with Cozzens are: Ernest K. Sadler, vice-chairman; E. W. Rockwell, treasurer; C. A. Wells, secretary; Charles Croft, hotels; Harry A. Lott, finance; Clayton M. Allen, entertainment; Louis L. Grandi, students; Elmer Niemoeller, publicity; Edwin W. Morris, technical program; H. J. Wheeler, registration; Richard L. Engel, inspection trips; Robert Milmore, arrangements; Gorden B. Kirkwood, sports; Robert A. Young, transportation; Mrs. Ernest K. Sadler, ladies.

Beasley Jones Norwood

Public Power Group Discusses BPA Rates

Differing opinions on the necessity of increasing Bonneville Power Administration rates were expressed at the 13th annual convention of the Northwest Public Power Assn., March 31-April 2 in Tacoma, Wash., attended by some 350 delegates.

Dr. William A. Pearl, BPA administrator, declared that three choices existed in the matter of rates subject to review this year. An increase could be made effective next year or at some other time during the five-year period for which rates are set, or could be delayed for five years with the realization that BPA would go into the red during the rate period.

Alex Radin, general manager of the American Public Power Assn., expressed confidence that "present Bonneville rates will prove to be more than adequate for the next five years, except for perhaps the last year." He predicted that "no increase will be made in Bonneville rates at the present time." If rates should be increased, the new rate will be less than the figure of $22.50 a kilowatt year which frequently has been quoted as a possibility, Radin added.

Bonneville rates also figured in a resolution adopted by the association, which proposed that BPA consider a policy of regarding its surplus as a "rate stabilization reserve" equivalent to one year's gross revenues. Present surplus, declared to be nearly $95,000,000, is far above current annual revenues of about $40,000,000.

Although Bonneville may have to raise its rates next year, the Pacific Northwest will have "relatively cheap power for years to come," Dr. Pearl declared. "Only approximately 17% of the potential hydroelectric power of the Northwest has been harnessed."

The BPA administrator predicted "ample resources in the region to serve all firm loads and some of the interruptible through 1960," even in critical water years. He also took an optimistic view of the possibilities after 1960, because of the present interest of public and private groups in obtaining dam sites.

Bonneville's interruptible power was discussed by Dr. Pearl and J. Frank Ward, managing director of the Washington State Power Commission. Pearl warned against the impression that Bonneville has an almost "unlimited supply of interruptible power," pointing out that there would be a shortage of 90 to 155 mw of such power in the low-water periods of median water years during the next decade. In critical years, this shortage would increase to a minimum of 600 mw during low-water periods.

Ward sought to allay fears of Oregon groups that the Washington commission seeks to monopolize all BPA power. The commission is interested only in secondary and "dump" energy, he said, for possible use in conjunction with a steam power plant.

The commission has "no evil designs on the steam business," Ward declared, but added that "it is not possible for any single company in the Northwest to construct a steam plant large enough to do any good," in the firming up of secondary energy.

"The Washington State Power Commission has a clear, unlimited field to develop power in the state," said Ward. It proposes to discuss with the federal government use of lease-purchase of federal transmission lines and cooperation to facilitate installation of additional generators in the Chief Joseph power house now under construction on the Columbia River, as well as cooperation in new construction, Ward declared.

Radin described the future of public power as in jeopardy, because of "no new starts of power projects, proposals for contracts which would seriously undermine the rights of the local public power systems and rural electric cooperatives" and a campaign of "unprecedented magnitude" by the private utilities against public power.

Reporting on two bills of interest to the Pacific Northwest, Radin judged a bill giving the Grant County PUD or associated groups authority to dam the Columbia River at Priest Rapids to have a better chance of passage by this session of Congress than a bill providing for development of the upstream Rocky Reach site by the Chelan County PUD.

"Reports are current in Washington that the Department of the Interior does not look with favor upon the section of the bill which permits BPA to purchase power from the Rocky Reach project," said Radin.

Ora Beasley of Northern Lights, Sandpoint, Idaho, was elected the new president of the association, to take office in the fall, with V. B. Jones of Tacoma City Light as vice-president and Ed Cooney, Cowlitz County PUD commissioner from Longview, Wash., as treasurer. Named to the board of trustees were Marlin Stewart of the Chugach Electric Cooperative, Anchorage, Alaska; Lee Darlan, Klickitat County PUD, Goldendale, Wash.; Peter Wallum, Hill County Electric Cooperative, Havre, Mont.; A. M. Kaesen, Lost River Electric Cooperative, Mackay, Idaho, and Eric Johnson of the Wasco Electric Cooperative, The Dalles, Ore., retiring president. Gus Norwood of Vancouver, Wash., continues as executive secretary. Eugene, Ore., was selected as the 1955 convention city.

Principal resolution passed at the convention pledged the association to "cooperate with other civic groups of the region in the preparation and sponsorship in the Congress on a bipartisan basis of legislation creating a regional public organization to carry forward the Northwest power program on a basis of assuring an adequate power supply, at the lowest possible rates consistent with comprehensive development of the water power resources of the Pacific Northwest."

Everett F. Cogan, IAEI technical assistant, at start of tour in San Diego of an . . .

Even Dozen Inspector Meetings

As great a variety of opinions and views about the code as there was of scenery in the West undoubtedly was found by Everett F. Cogan, technical assistant secretary, International Association of Electrical Inspectors, Chicago, as he made the tour of 12 Western chapter meetings between March 31 and May 8. It was his first trip and a strenuous one. It began with the Southern California Chapter at San Diego, March 31. Next in line came a joint meeting of Northern California, Central California and Sacramento Valley Chapters at San Jose, April 3; Oregon Chapter, Portland, April 6; Puget Sound, Olympia, April 9; Eastern Washington, April 12, Spokane; Idaho, Boise, April 15; Montana, Bozeman, April 19-20; Nevada, April 24; Rocky Mountain, Denver, April 30; New Mexico, Albuquerque, May 3 and Arizona, Phoenix, May 8.

In each case Cogan brought a message from Charles L. Smith, IAEI secretary and an account of IAEI activities and program. He particularly stressed "Electrical Safety Week," Oct. 18 to 25, coincident with the celebration of Light's Diamond Jubilee, and urged the chapters to set up committees now to organize the publicity for this national observance.

Reports from all the chapters are not yet available but from those that are it is evident Cogan heard a variety of code questions and inspectors' problems.

Trailer Park Wiring

At the San Diego meeting, presided over by Willard Burk, Huntington Park, the major problem seemed to be wiring of trailer parks. As recited by Ben Wheater, Long Beach inspector, who had copies of requirements just passed by that city, the trailer of a few years ago with a 300-w total load is succeeded by many with 3 kw of heating and cooking and other appliance load. The state housing commission had asked the inspectors to assist it by preparing standards that would be applicable all over. A difficulty of jurisdiction hinders the State Safety Orders from being the media for such regulation and the housing commission is not empowered to do much with electrical matters. A committee was appointed to bring in definite proposals at the next meeting in Long Beach.

A visit to the new Underwriters' Laboratories building under construction at Santa Clara, with explanations of the provisions being installed for electrical testing from Howard Dodge, UL engineer in charge, and construction details by Harold Gerber, electrical designer for it, was an extra at the San Jose meeting of the three chapters.

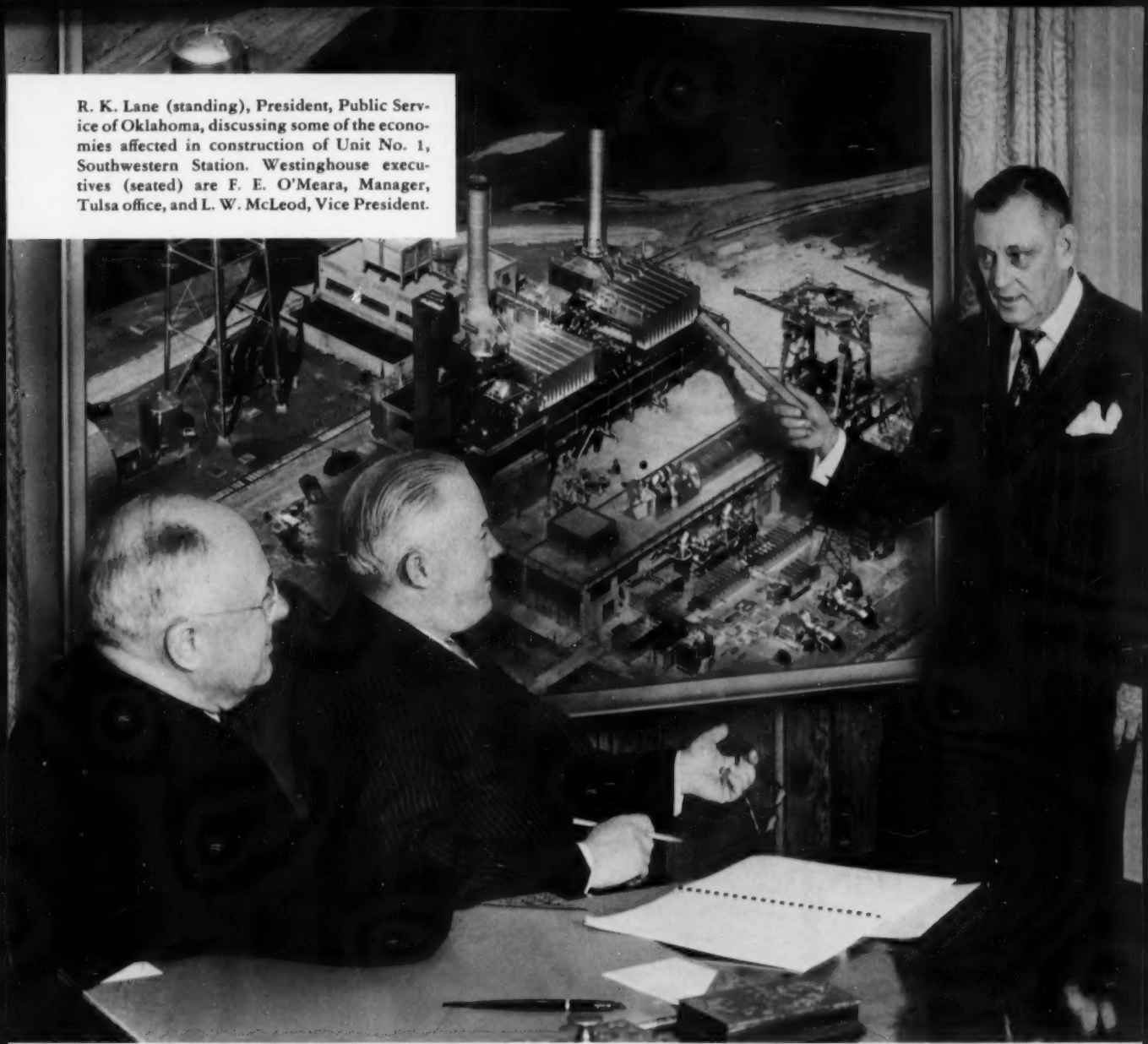
At Olympia the Puget Sound Chapter saw demonstrated by Earl Miller of National Neon Co. an UL-listed new protector for the secondary circuits of gas tube signs. In event of tube failure it shorts out the transformer secondary. C. M. Kirsop and C. S. Alger reported on tests made of the demand from five fully equipped houses having large families. Maximum 15-minute individual demand recorded was 13 kw; the average simultaneous demand for all six was 6.6 kw. Such tests, they said, indicated it was safe to permit addition of a dryer to an existing No. 4 service entrance. John Watt presided at this meeting.

Code Discussion Lively

Montana Chapter's meeting was staged at Montana State College. Code discussion was lively as both John Larimer, chairman, and Bob Cooks, vice-chairman, presided over sessions. A demonstration of phase converters to change from single to three-phase was held and there were talks given by Prof. Sheckles and by William Henry, manufacturer of the Henry converter. Because of longer starting, delta motors were not recommended. Considerable discussion over BX cable also was had. As this was the annual meeting new officers were elected: W. F. Kinkade, Missoula, chairman; W. Talbot, first vice-chairman; A. L. Shrock, second vice-chairman, both of Missoula; Claude Angle, Ennis, secretary-treasurer. Next annual meeting will be in Missoula in 1955.

State inspection was strongly urged at both the Montana and the Nevada Chapters. With a record attendance (85 at the code breakfast, 150 the banquet) the Nevada meeting was perhaps the liveliest of them all. E. E. Carleton, Southwestern Section president, attended and reviewed the whole problem of state inspection from the experience of California Division of Industrial Safety, of which he is supervising engineer. Fred Clayton of Nevada Public Service Commission likewise dealt with the legal phases. Howard Lindsey, California-Pacific Utilities Co., chairman, and Mel Lundberg, Elko-Lamoille Co., again proved wonderful hosts.

Utah Chapter had disappointing attendance but a good code discussion. Howard Dodge, UL engineer, pointed out the increased responsibility on the inspector where panel base assembly of switchboards is involved. (More next month on all meetings.)



R. K. Lane (standing), President, Public Service of Oklahoma, discussing some of the economies affected in construction of Unit No. 1, Southwestern Station. Westinghouse executives (seated) are F. E. O'Meara, Manager, Tulsa office, and L. W. McLeod, Vice President.

From cotton field to power plant... in 369 days

Public Service of Oklahoma's amazing feat of transforming a cotton field located over a solid base of sandstone—with no access roads available—no power in the vicinity—to Unit No. 1 of Southwestern Station is a story worth telling.

Public Service started the story when they decided to meet their growing load with additional capacity in their southwestern region. The site on the Washita River, 150 miles southwest of Tulsa, Oklahoma, was selected because it had a water supply not generally available in this region. It was at the load center and the geographic center of this growing region and near the center of the Anadarko Basin oil and gas fields with a ready supply of reasonably priced fuel.

Early in the planning stages, the utility with their

(*continued next page*)

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Westinghouse

(continued from preceding page)

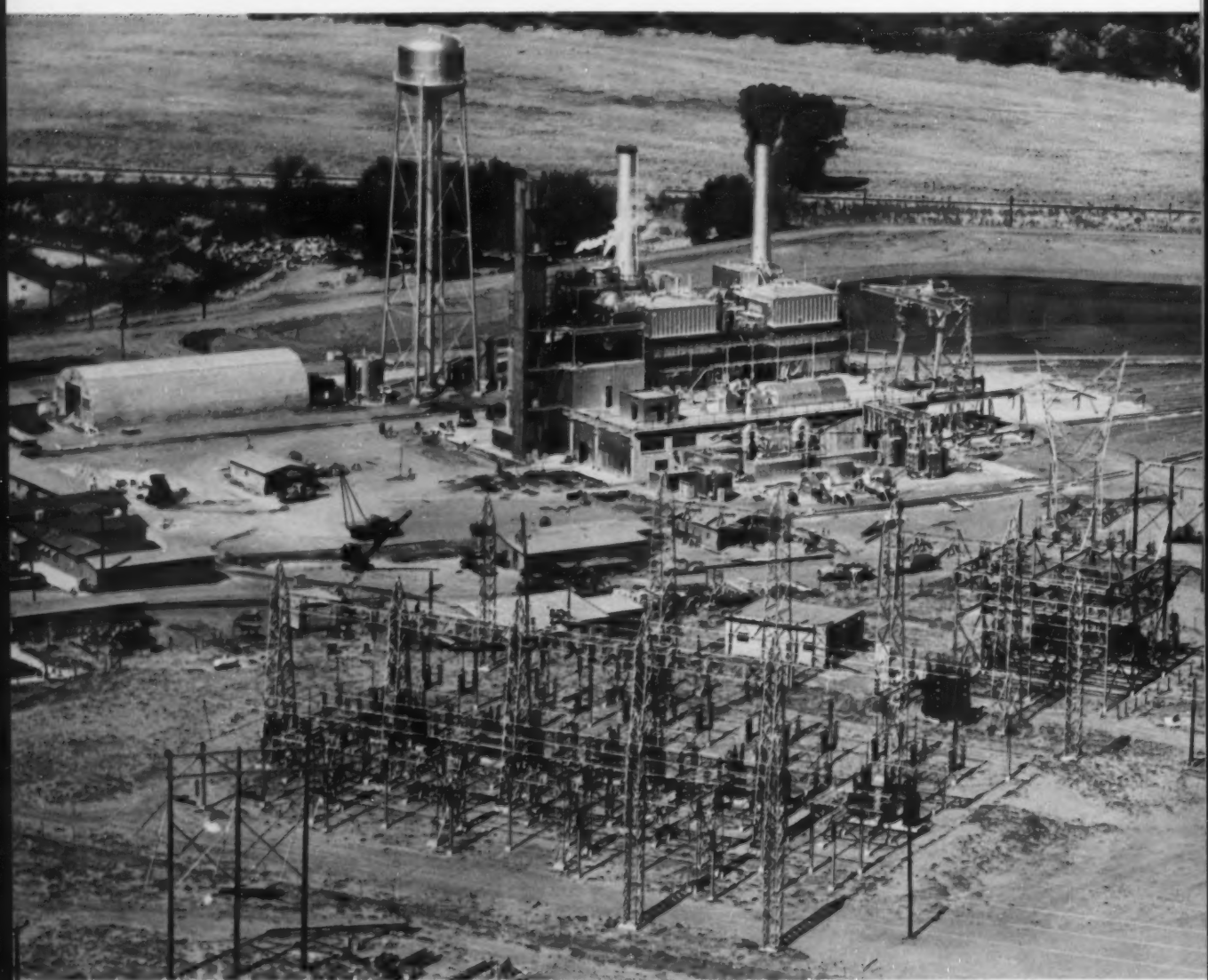
consultants (Sargent and Lundy) determined that Southwestern Station would be an outdoor station and that the prime supplier of equipment would be Westinghouse. Choosing Westinghouse as the single supplier for all major components permitted side-by-side planning and the extra advantage of on-the-spot refinements and economies in equipment and selection.

Public Service then constructed ¾ of a mile of new railroad track, rebuilt bridges and cut 3½ miles of road to the plant site.

539 construction workers were employed in erecting Unit No. 1. Weekly meetings were held throughout the construction period with foremen and construction workers to discuss progress and plan work schedules for the coming week. All personnel were thus kept fully acquainted with the over-all status of work . . . a foresight which expedited "on-the-line" date by 60 days.

• • •

Aerial view of the complete installation of Unit No. 1 at Southwestern Station of Public Service of Oklahoma showing the adjoining substation.



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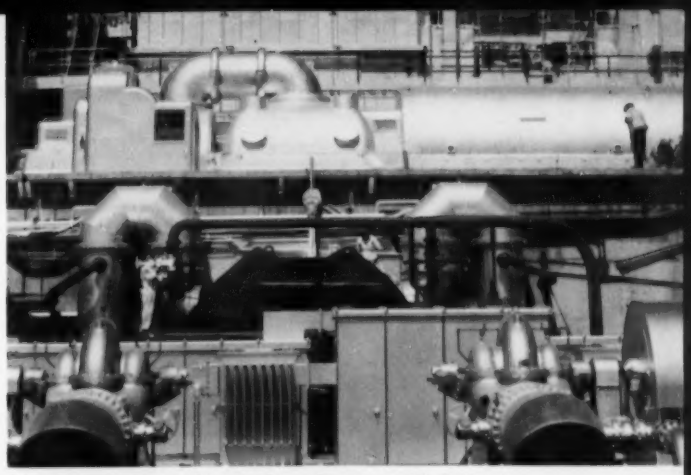
In spite of location "extras", installed cost was only $99.83 per kw output

The low installed cost of $99.83 per kw actually realized on this project as against costs of $125.00 and $135.00 per kw for a conventional power station was more remarkable in view of the many "extras" required because of location.

For example, a special water-treating plant was necessary due to the high mineral content of the water. The low rate of flow of the Washita River necessitated the erection of a special, eight-cell cooling tower and two water storage reservoirs holding 33 million gallons.

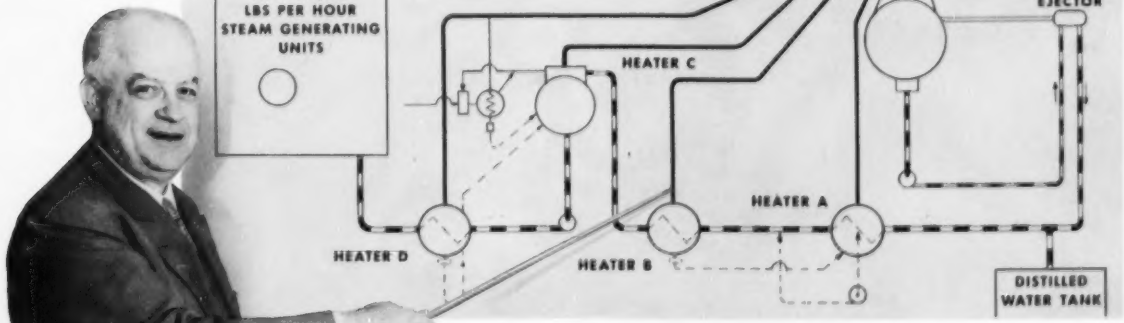
The cooling towers, particularly, placed unusual burdens on other station equipment. The fan on each cell required a reliable and high-torque electric motor drive, which was taken care of by using standard Westinghouse Life-Line® motors. The towers also imposed a higher pressure head on the condenser. Westinghouse met this unique problem by applying their extensive heat exchange experience to design a condenser which kept moments (forces) on the turbine exhaust within normal values, for more efficient and dependable operation.

In spite of these location, design and construction problems, Public Service of Oklahoma made a remarkable record in getting "on the line" and attaining heretofore unavailable economies in new station construction.



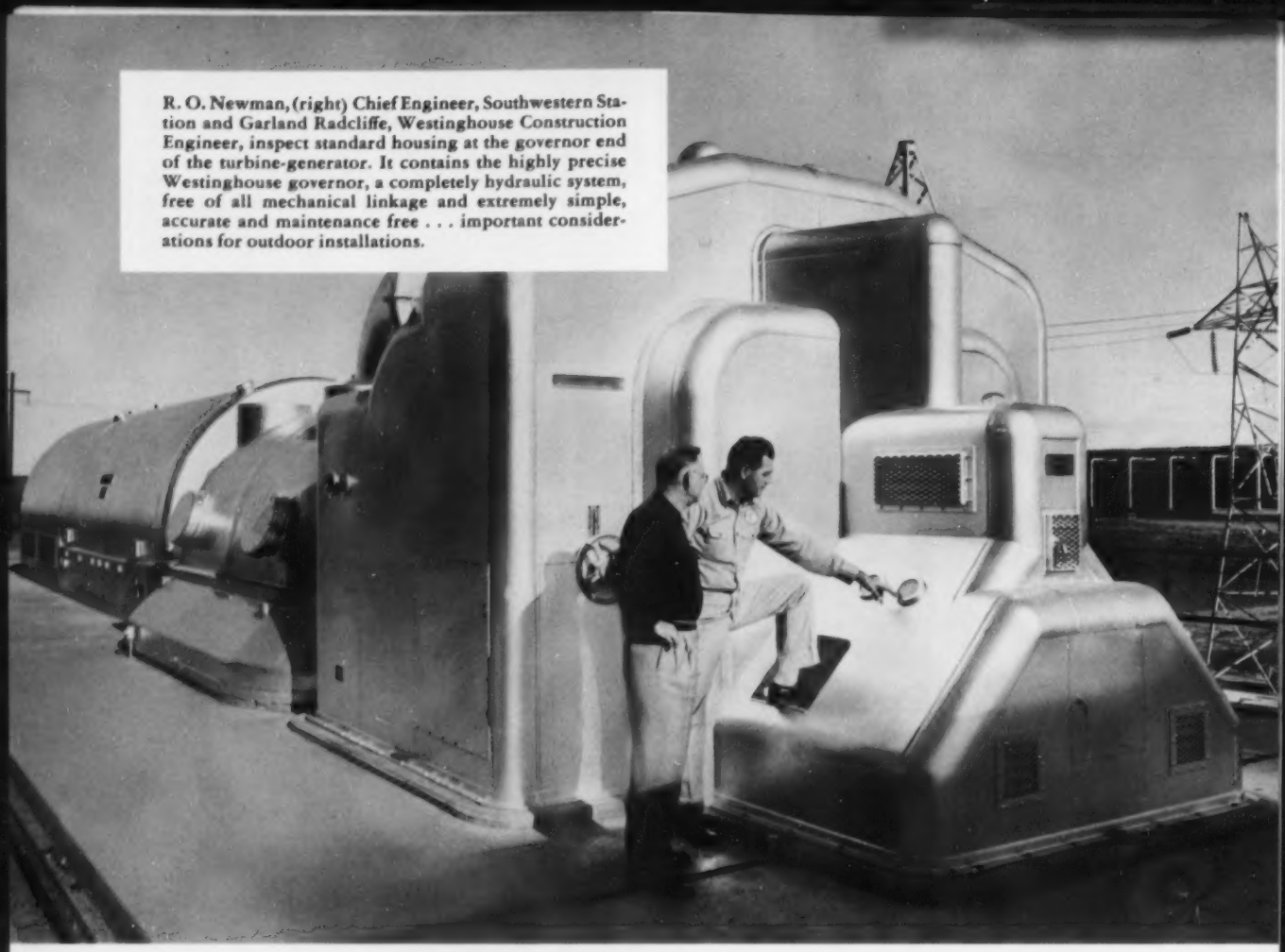
Single source for turbine and condenser enabled Westinghouse to design for low headroom and improve performance by engineering the two as a "package" for all steam and water conditions.

The mineral content of local water and low flow of the Washita River required a special water system. This included two 33 million gallon storage reservoirs and an eight-cell cooling tower, shown above.



Steam rate to turbine (lb /kwh)	8.28
Btu/kwh to turbine	9,382
Boiler efficiency	83.1
Btu/kwh sent out (100% Op. Efficiency)	11,822
Plant thermal efficiency	28.87

G. I. Page, Superintendent of Operation and Construction at Public Service points out a typical performance diagram for Unit No. 1.



R. O. Newman, (right) Chief Engineer, Southwestern Station and Garland Radcliffe, Westinghouse Construction Engineer, inspect standard housing at the governor end of the turbine-generator. It contains the highly precise Westinghouse governor, a completely hydraulic system, free of all mechanical linkage and extremely simple, accurate and maintenance free . . . important considerations for outdoor installations.

Design coordination of steam apparatus speeds planning, construction

One way Public Service attained low installed cost was by relying on their single supplier for recommendations and manufacturing coordination of all apparatus. This was specifically reflected in selection of the turbine-generator. Westinghouse experience in utility industry requirements indicated that Public Service's desire for maximum economy could best be met by specifying a 66,000-kw ASME-AIEE Preferred Standard Design. This choice not only cost the utility less for actual equipment, but reflected additional savings in speedier delivery.

Coordination proved valuable in other areas as well. In outdoor plants it is essential to keep headroom low and locate major components in a compact area—to realize savings in foundation and structural costs. In helping Public Service effect these cost reductions, Westinghouse designed their turbine-generator and condenser for low headroom installation, using conventional bottom-mounting, instead of a more costly side-mounting condenser.

The same problem of space economy led to the use of vertical-type feedwater heaters. The ruggedness and high efficiency demanded for outdoor installation and effective boiler feedwater heating are inherent in the design of the one high pressure and two low pressure units which were furnished. No extra construction, protection or design consideration was needed.

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Unique techniques expedite installation, lower costs

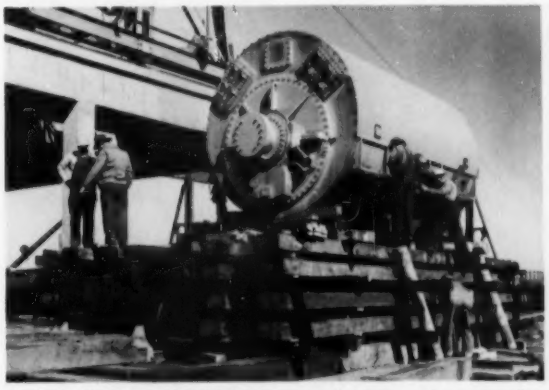
W. C. McGuire, Project Manager for Public Service, assisted by Westinghouse field engineers, used every possibility afforded by the outdoor construction and Westinghouse design simplicity and coordination to set the Southwestern Station "on-the-line" record.

Again the planning and supply of all apparatus from a single source was a major factor. The care and skill of Westinghouse turbine design and manufacture, especially, made installation of the turbine an easy job. The precise factory balancing of the rotor, the extensive factory testing before shipment, the coordinated design of turbine and generator streamlined the installation and resulted in perfectly smooth operation from the moment the turbine went on the line.

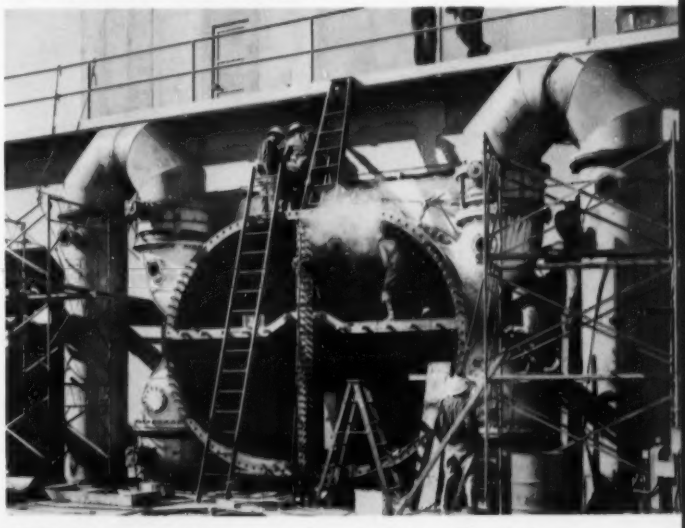
The completely self-contained generator with hydrogen cooler was moved into position alongside the foundation and thus easily slid into place. This saved many man-hours of work.

Westinghouse also designed the condenser for welded assembly right on the job—split along the horizontal. It was again, a simple matter to assemble outside the foundation and slide into place . . . ready for final connections. Similar procedures worked equally well with all the other heat exchange apparatus which was assembled on the ground and readily hoisted into place, resulting in a saving over more conventional methods.

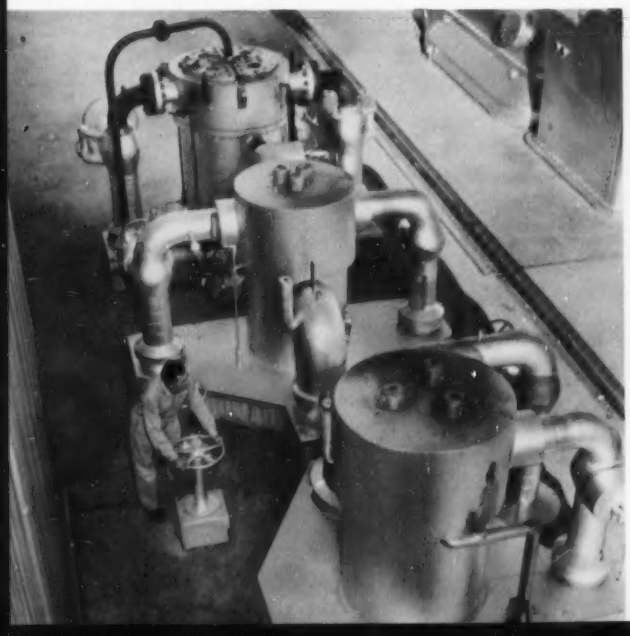
Expert design and precise manufacture of this turbine rotor help assure perfect mating of turbine and generator. It is a big reason why Westinghouse turbine-generators get on the line quickly and stay on.



Public Service of Oklahoma saved time and money by cribbing up the Westinghouse generator level with the top floor, then sliding it into position on the foundation. Outdoor construction of the station and rugged integral design of the generator made this possible.

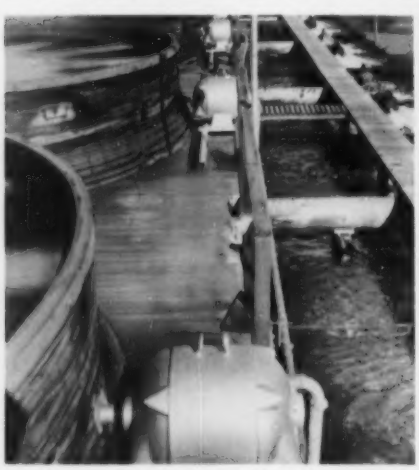


Shell of specially designed condenser in place. Top and bottom sections were completely assembled and welded outside the foundation—a cost-saving technique made available through Westinghouse experience.



◀ Chief Engineer R. O. Newman at feedwater heaters. The high pressure unit, to the rear, is equipped with exclusive quadrant head—specially designed to provide the strongest construction and greatest dependability.

Project Manager W. C. McGuire checks blueprints of the circulating water pumps which operate at 30,000 gpm. They are driven by Westinghouse 800-hp, 14-pole induction motors. Special weather-protected construction provides adequate outdoor protection here with minimum expense. Covers and air shields of these motors are easily removed for inspection. The split-bearing construction permits removal without disturbing the bracket mounting.



Each of the eight giant fans on this cooling tower is powered by a Westinghouse Life-Line motor. The tower's total capacity of 60,000 gpm is part of the service water and treated water systems, supplementing intake from the Washita River.

Condensate is pumped by this 60-hp, Life-Line CSP® motor to the deaerating tank and heater. A duplicate stand-by motor is provided. Vertical mounting of the motor integral with the pump shaft saved space and time here.

Compact control centers provide one-point control and protection of powerhouse auxiliaries. Standard vertical sections provide complete flexibility. Motor starters up to NEMA size 7 can be included.

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Special attention given powerhouse motors insures economy of electrified auxiliaries

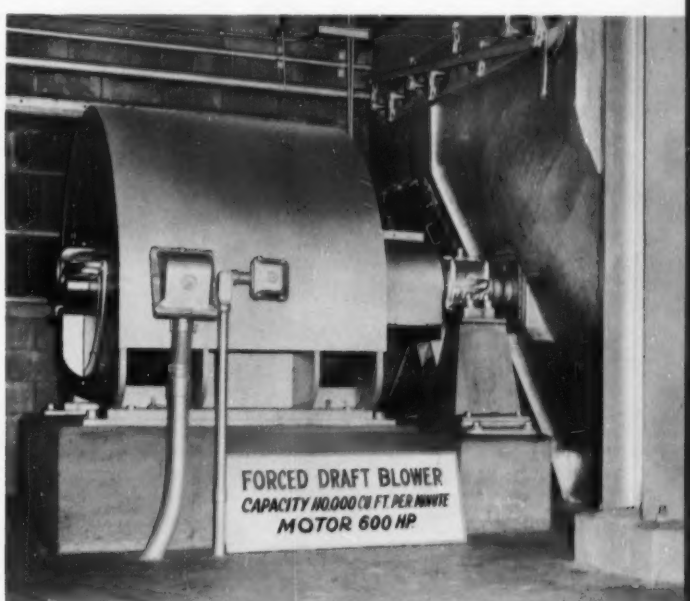
By relying on Westinghouse powerhouse motors for all auxiliaries at the Southwestern Station, Public Service of Oklahoma gained many installation and operating economies. Westinghouse engineers special-ordered each motor for maximum attention to construction details and minimum delivery time. Once installed, each motor was quickly tied into the station auxiliary power system. The expense and time of constructing auxiliary steam lines and reducing stations were eliminated.

Operating economy resulted, too. Without auxiliary steam requirements, make-up feedwater demands were reduced . . . an important factor at Southwestern Station where extensive feedwater treatment is necessary. In addition, auxiliary motor control panels are centrally located to cut down on time required for operation.

Westinghouse engineers assured Public Service of Oklahoma of the continued economical operation of these powerhouse motors. Each installation received special attention: first, in analyzing load conditions and horsepower requirements; next, in construction, with all component parts being tested for highest quality workmanship. Finally, before shipment, each motor was given a complete operating test and inspection by the Westinghouse quality control department.

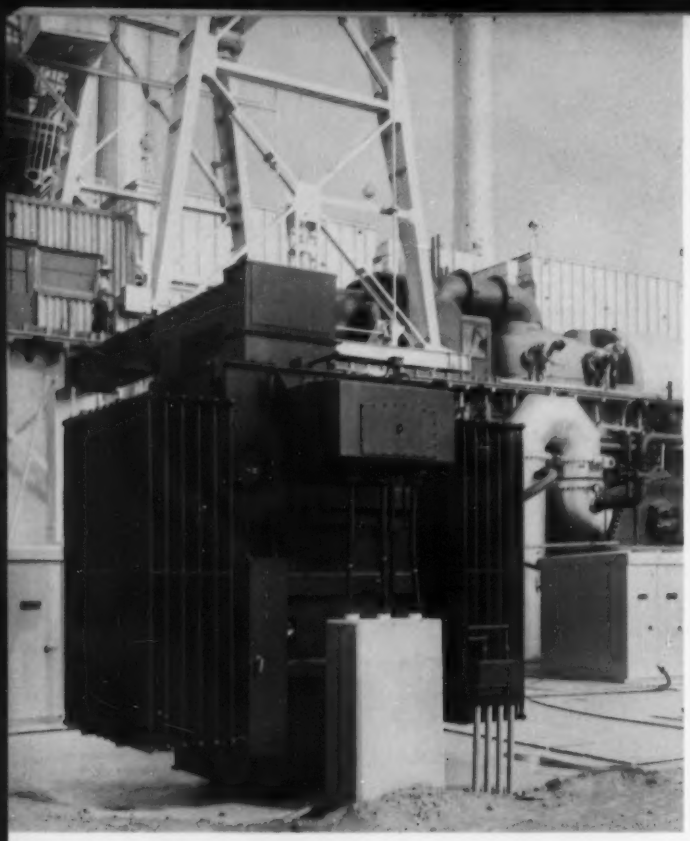
Westinghouse powerhouse motor insulation provides greatly improved dielectric and physical strength as well as superior moisture resistance. Two extra dip and bake insulation treatments are given all powerhouse motor windings as added protection against heat, dust and other adverse operating conditions.

Two 1750-hp, 3600-rpm Type CSF motors supply power for boiler feed pumps in Unit No. 1. These motors are self-ventilated with louvers and internal baffling to direct air flow to best advantage.



Forced-draft blowers on both boilers in Unit No. 1 are powered by Westinghouse 8-pole, 600-hp weather-protected induction motors.

Westinghouse



Shown above, one of two identical Westinghouse 6000-kva, 13,800-volt auxiliary power transformers of core form design. Westinghouse core form transformers can be built using one of five types of windings to meet specific current and voltage requirements. These five types are: (1) Continuous pancake, (2) Hisercap, (3) Lowgrocap*, (4) Helitran, (5) Cylindrical. *Trademark

Transformer design adaptable to fast, economical installation . . .

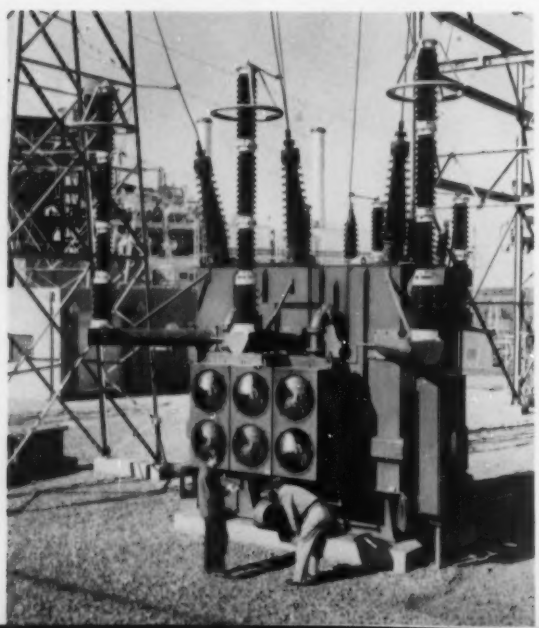
For instance, a 97-ton, 50,000-kva Westinghouse autotransformer was installed in 9 hours flat, resulting in an inexpensive installation.

The main power transformer at Southwestern rated at 88,500 kva, 138 kv, is of exclusive Westinghouse "Form-Fit" design, which enabled one-piece shipment direct to the site. Form-Fit construction using grain-oriented Hipersil* core steel with greater flux-carrying capacity permitted an approximate 20% reduction in weight, 15% smaller ground area. These factors coupled with lower over-all height made possible the use of lighter handling equipment and minimum steelwork.

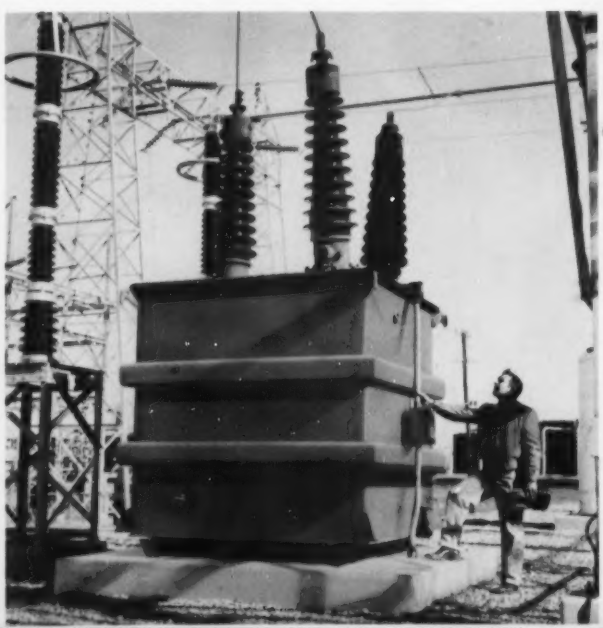
In addition, Southwestern uses economical Westinghouse standardized design transformers, of core form construction, wherever possible.

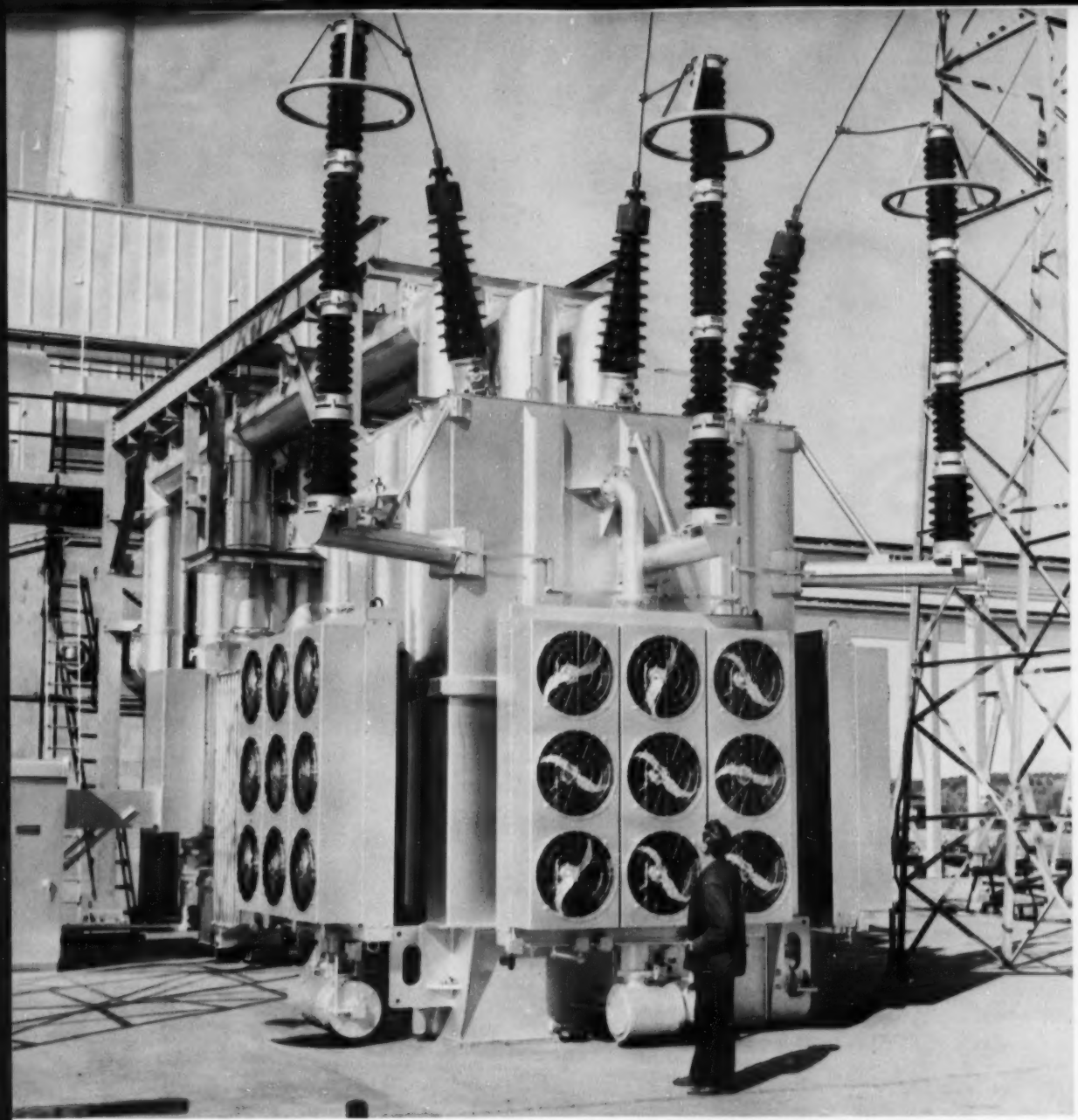
The utilization of both Westinghouse Form-Fit and core form power transformers gave Southwestern many advantages in efficiency and economy not obtainable with the application of just one design throughout. This selective factor contributed greatly to their excellent cost record.

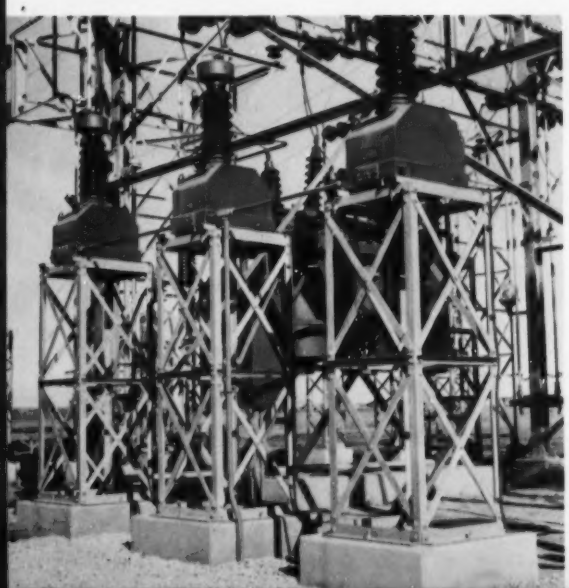
D. R. Campbell, Station Engineer and R. W. Ingalls, checking out the 50,000-kva, 138-kv/69-kv power transformer used in the substation. It is smaller and lighter per kva because of its Form-Fit construction. The lightning arresters are Type SV outdoor arresters capable of discharging lightning surges of more than 100,000 amperes.



W. G. Steidley of Public Service examines the Westinghouse OA Grounding Transformer. The unit is rated 3,180 kva, three phase, 13,800 volts, 400 amperes ground current, 40 ohms per phase impedance. The hermetically-sealed Type S condenser bushings provide the highest possible dielectric and mechanical strength.







R. W. Ingalls, Assistant Chief Engineer of Southwestern Station inspects the 88,500-kva, 138-kv Westinghouse power transformer. The exclusive Form-Fit design of this FOA unit made possible smaller size and weight while still providing greater mechanical, thermal and dielectric capabilities.

◀ This neat, metering installation features three Westinghouse Type OPT Potential Transformers. Rigid production-line quality control assures dependable long-term accuracy.

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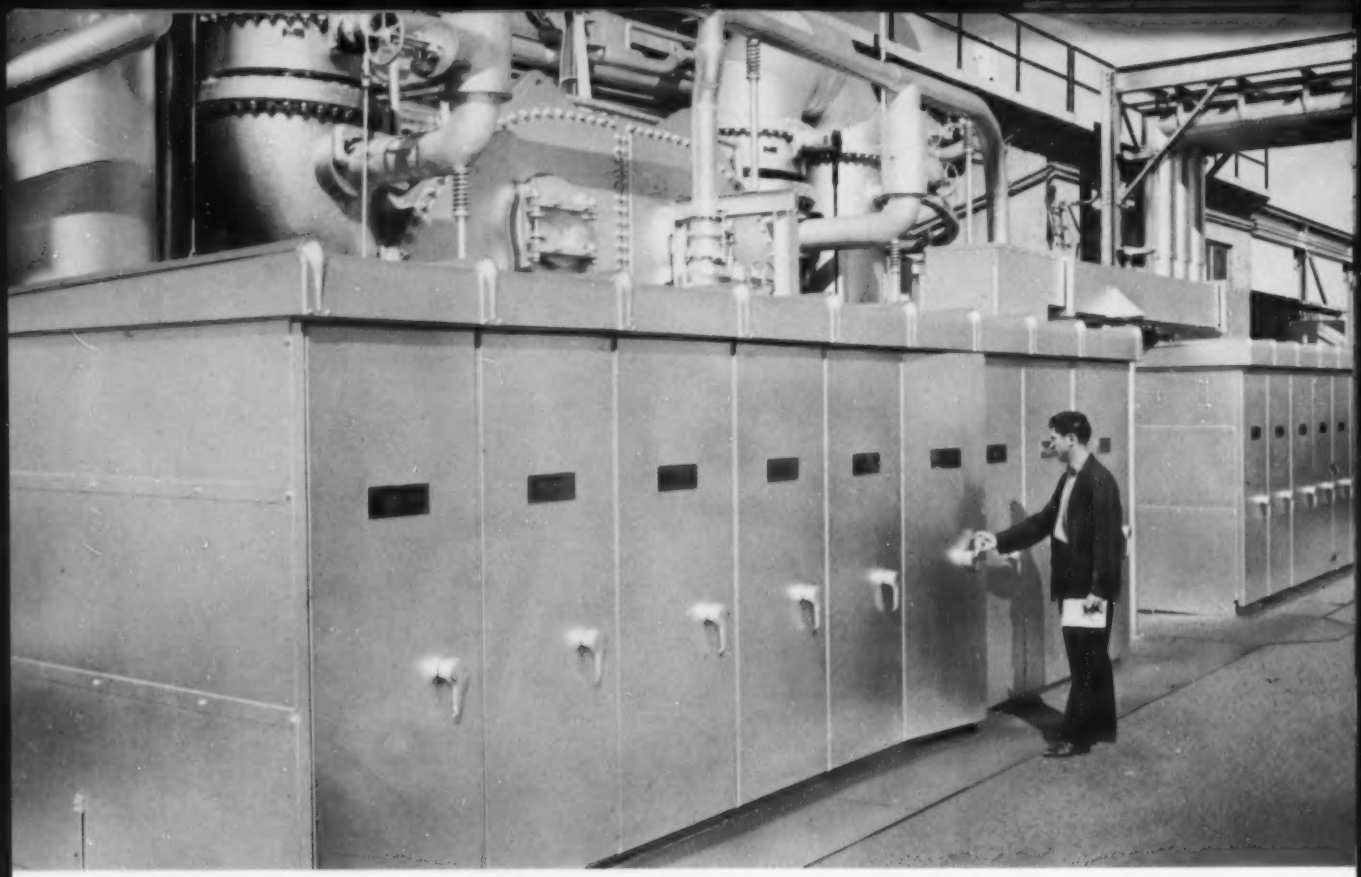
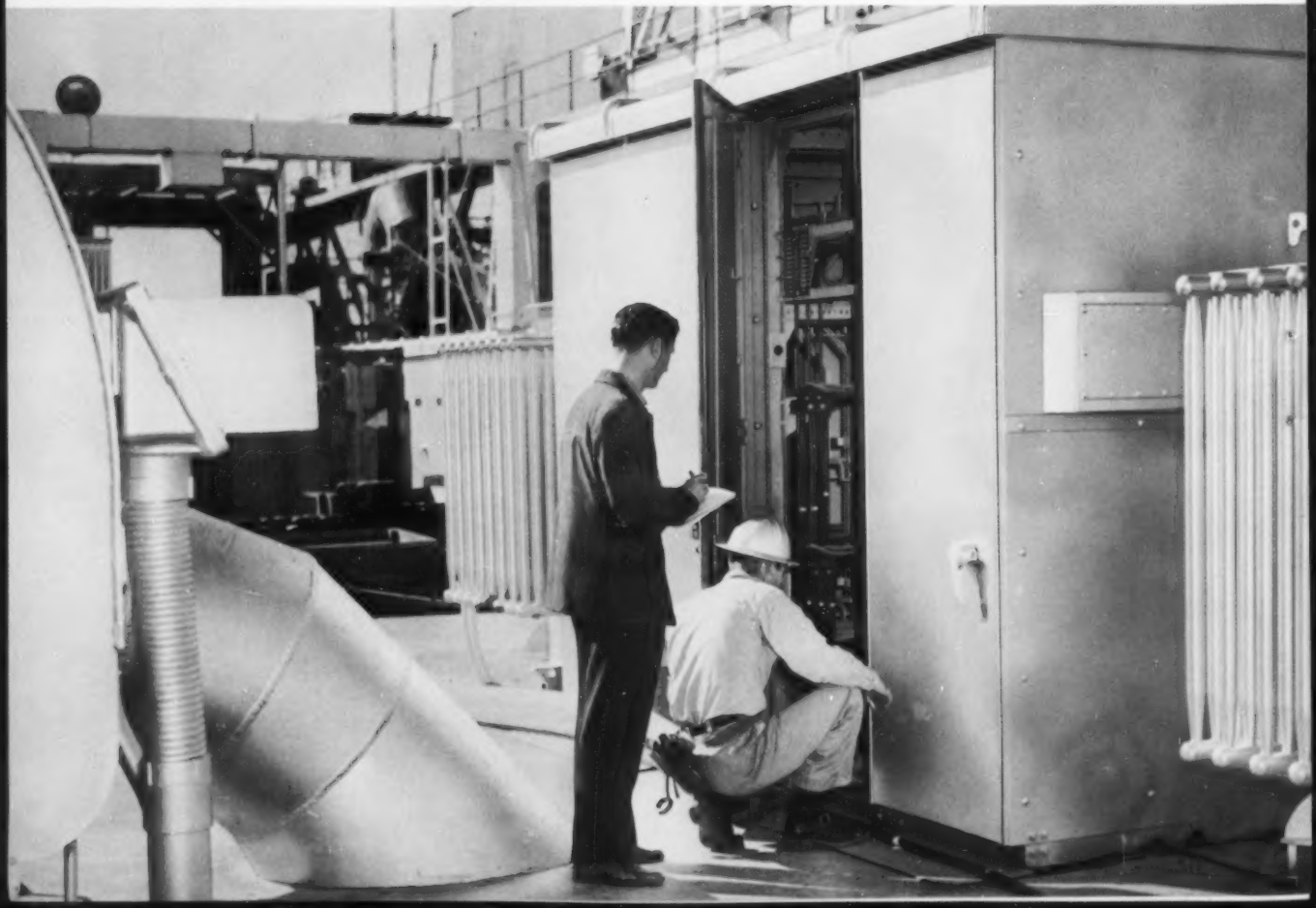




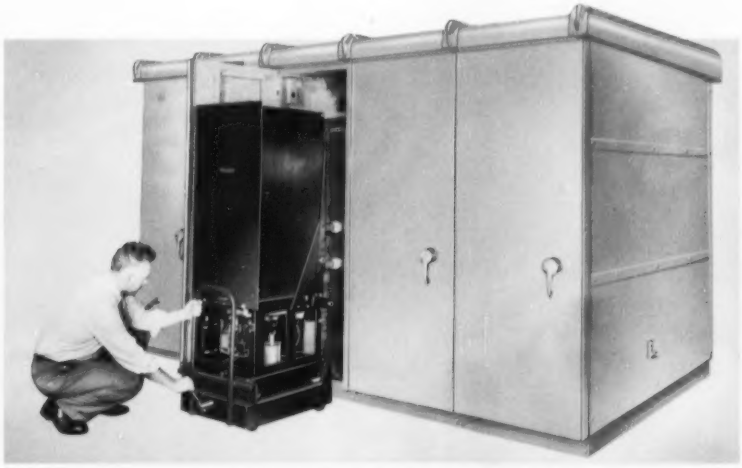
"Westinghouse outdoor metal-clad switchgear is easy to install"

W. C. McGuire, Public Service of Oklahoma's Project Manager, made this statement. He based it on outstanding features of this outdoor switchgear installation. Its compact, metal-enclosed design simplified unloading and foundation arrangements. The switchgear needed only to be mounted on the foundation, and then the main and control circuits were easily connected. The complete apparatus was factory assembled, factory wired and factory tested, eliminating all such requirements at installation point.

Standardized design throughout the switchgear contributes to lower cost of operation and maintenance. Metal-enclosed compartments provide safe, convenient accessibility to all component parts and permit more circuits in less space. Horizontal drawout breaker arrangement permits easy inspections or replacements. Maintenance of the switchgear is simpler because the time required in getting to and servicing the components is reduced to a minimum.

The integral unit design facilitates the addition of future circuits as they are required.

◀ R. W. Ingalls of Public Service is shown checking out this flexible, compact 2,300-volt Westinghouse unit substation. An outdoor installation of this type is under constant attack—inside and out. To combat internal arc damage, Westinghouse lines arc chutes with a true ceramic material containing zircon, which has the highest melting point of any known material.



De-ion® air circuit breakers used in Westinghouse switchgear draw out horizontally. No lifting or lowering is necessary. This reduces routine testing and maintenance time. Breakers of the same rating are interchangeable and can be replaced in a matter of minutes. All Westinghouse breakers take advantage of the De-ion principle of arc quenching which literally snuffs out the arc in as little as one cycle or less.

◀ The 440-volt power center, like its big brother, contains all of the basic construction details perfected by Westinghouse through years of practical application—under all conditions. To combat external weather, all metal parts are Bonderized for protection against rust and corrosion. Undersurfaces are sprayed with heavy rubberized coating.

YOU CAN BE SURE...IF IT'S

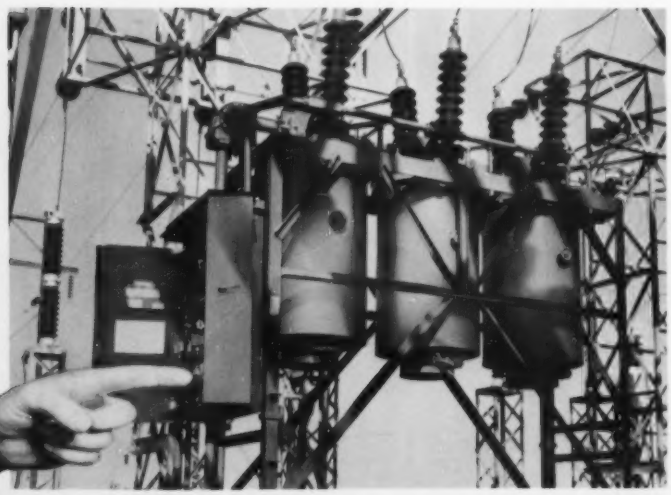
Westinghouse

Power breaker design simplifies maintenance— field adjustments

The selection of floor-mounted Westinghouse power circuit breakers for Public Service of Oklahoma's Southwestern Station was based on their over-all simplicity of design, ease of installation, ease of inspection and adjustment. Result: less maintenance.

Westinghouse De-ion grids, for example, use the multiflow principle of arc interruption which provides high-speed clearing of faults with very short arcing time and low arc energy. Result: less contact burning and oil deterioration.

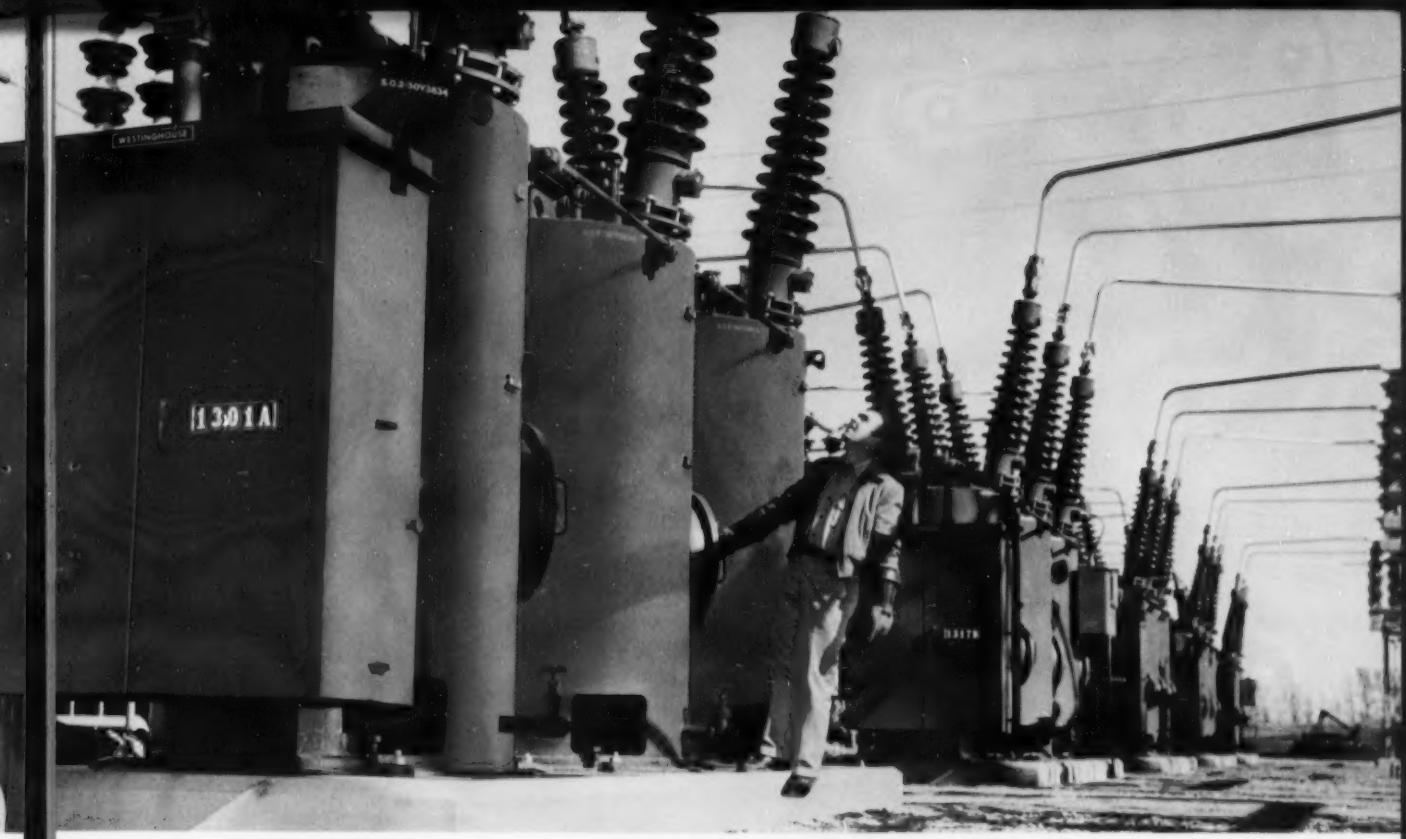
The condenser bushings used in Westinghouse power circuit breakers are designed on the sound electrical principle of uniform voltage distribution. Bushings through 69 kv are solder sealed and the higher voltage bushings are oil impregnated. Result: no radio interference, long insulation life.



Southwestern Station's Chief Engineer, R. O. Newman points out one of his Westinghouse 69-kv frame-mounted oil circuit breakers. These units were shipped completely assembled and adjusted, thus minimizing installation expense.

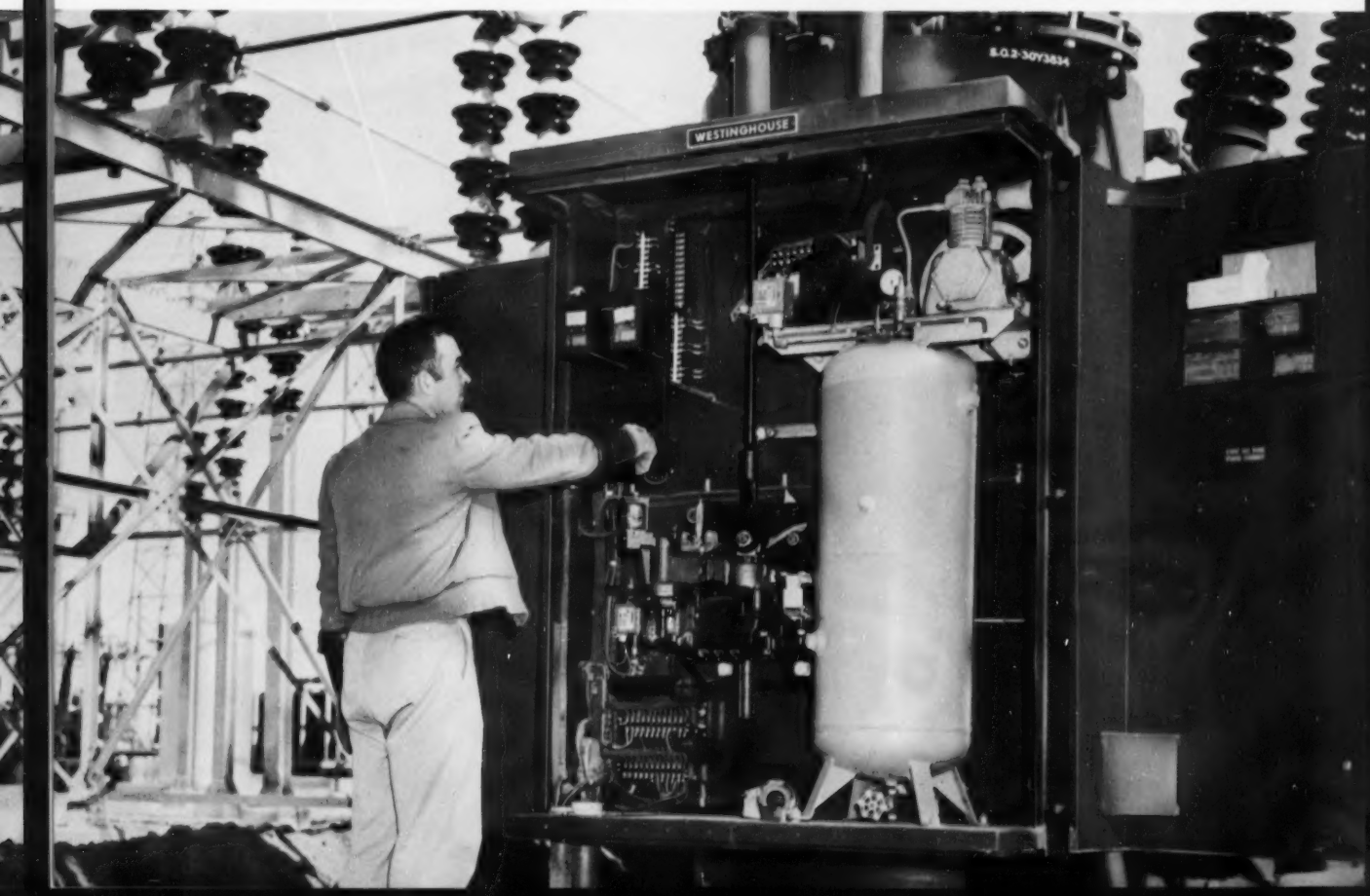
YOU CAN BE SURE...IF IT'S

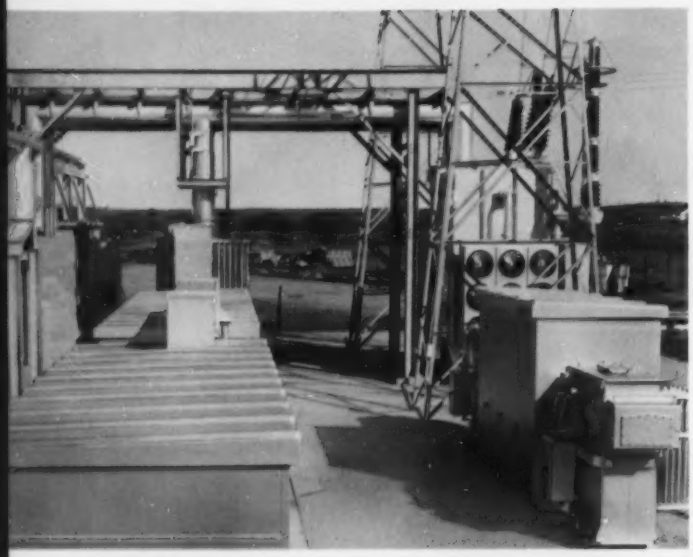
Westinghouse



Above, W. G. Steidley checks an imposing line-up of Westinghouse Type GM, 138-kv breakers. Known for their High-Power-Laboratory-verified fast fault clearing and high-speed reclosing, Westinghouse breakers aided Public Service of Oklahoma in increasing load limit and improving system stability—with a minimum investment in transmission lines and equipment.

Below, the pneumatic operating mechanism shown operates all three poles of the three-phase breaker simultaneously. Westinghouse mechanisms are mechanically trip free to insure fast parting of contacts under any condition of opening. Reclosing can be as fast as the system requires —without shock or hammering of mechanism parts.





In the upper background is a portion of the Westinghouse isolated phase bus at Public Service of Oklahoma's Southwestern Station. The cylindrical aluminum enclosures provide maximum mechanical strength and electrical protection. Proved Westinghouse design and construction simplify installation, reduce maintenance.

Isolated phase bus provides the ultimate in reliability

The generator terminals at Southwestern Station are tied directly to the main power transformer by Westinghouse isolated phase bus. This is Public Service of Oklahoma's first isolated phase bus installation. It is expected to last the lifetime of the generator and transformer.

The cylindrical aluminum enclosures of the bus are noncorrosive, light weight, and nonmagnetic. This type of construction provides the highest degree of mechanical and electrical protection with complete safety to operating personnel.

Resilient cork-Neoprene gasketed joints seal out dust and moisture. Insulators are designed with extra-large diameter for higher mechanical strength, with deep corrugations for greater creepage distance. The bus is usually factory assembled in large, complete sections for easy installation.

This isolated phase bus installation provides maximum reliability and requires virtually no maintenance.

Automatic operation, low maintenance . . . assure long-term economy

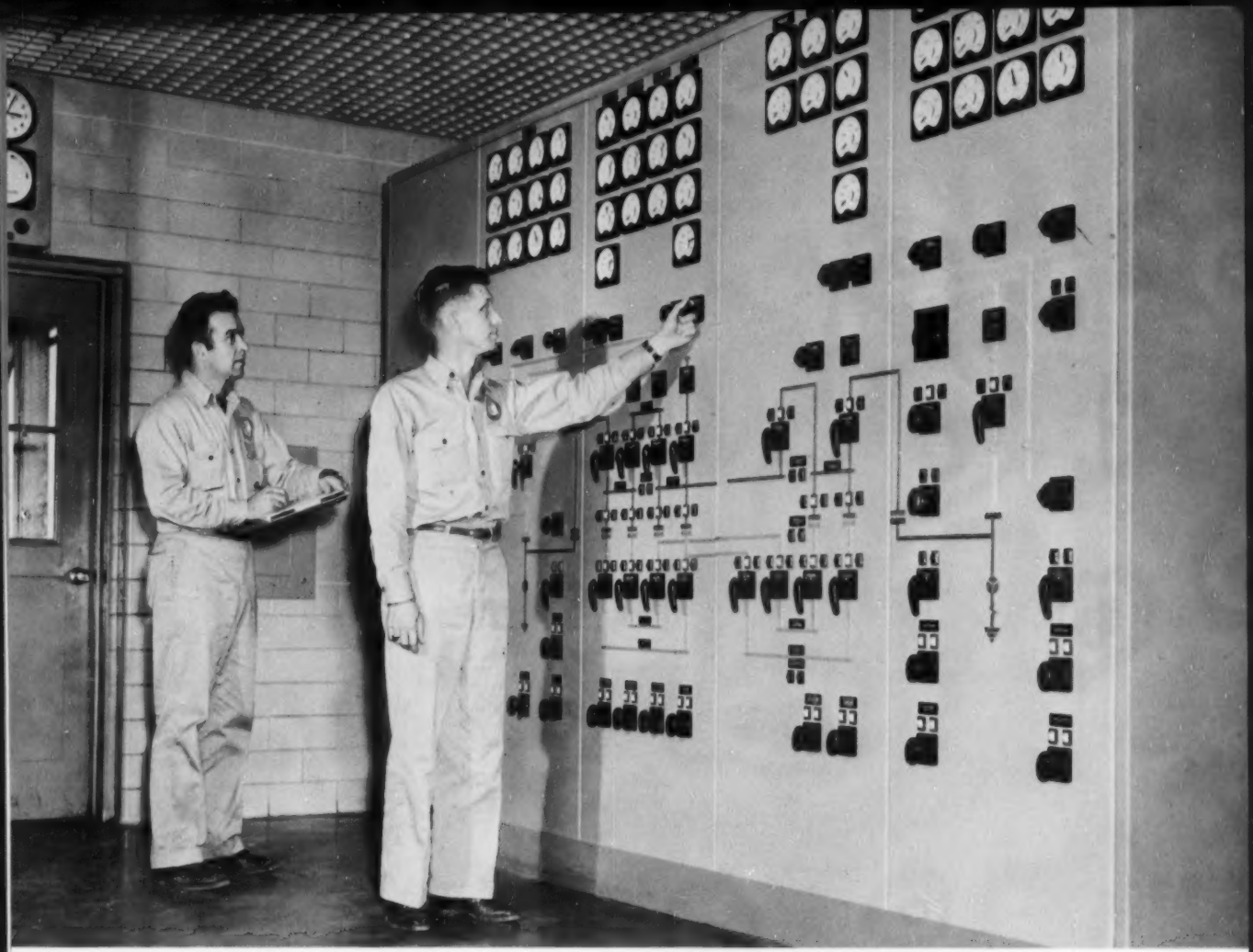
Public Service of Oklahoma, with Sargent and Lundy, carried their imaginative planning all the way through to plant control. One centralized watch station provides all controls . . . mechanical and electrical—for both generation and transmission. The Westinghouse turbine-generator follows this pattern by having throttle and all other controls tied into one central hydraulic control system. This is the main reason why this station requires only four men per shift with a single operator in the control room responsible for the boiler, generator and transmission panels. Maintenance, always expected to be low on such an installation, has been at the unusual minimum of 125 hours down time for the first 12 months of operation. Most of this was for tying in transmission lines and connecting piping.

The standard outdoor specifications of all equipment have increased total costs only a fraction of those required for conventional-type enclosures. Equipment investment and fixed costs were thus reduced and added savings on building maintenance were realized.

The simplicity of operation, minimum maintenance, and improved over-all efficiency at which Unit No. 1 is operating, are attributed in part to the excellent planning and "start-to-finish" cooperation of the utility personnel and local Westinghouse engineers.

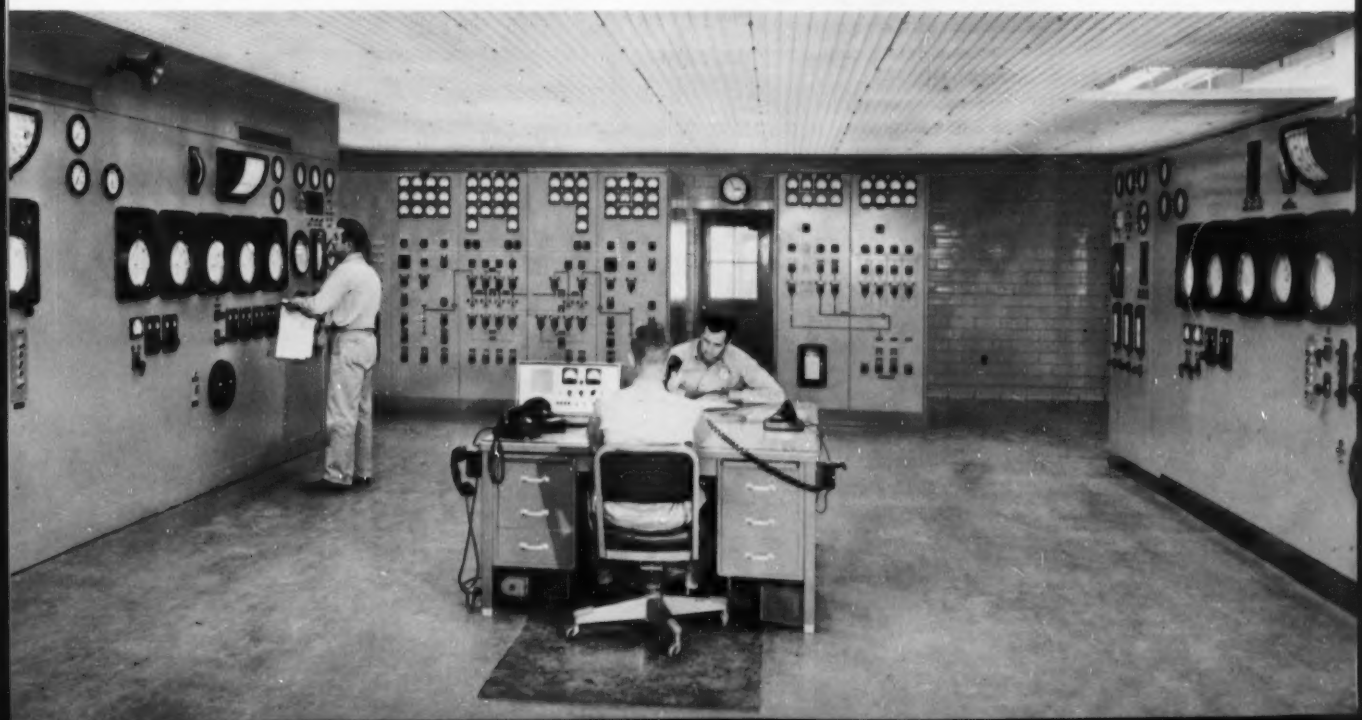
To us, the installation of Southwestern Station has established a new high in cooperative engineering and development for highest over-all results to utility, supplier and the community served.

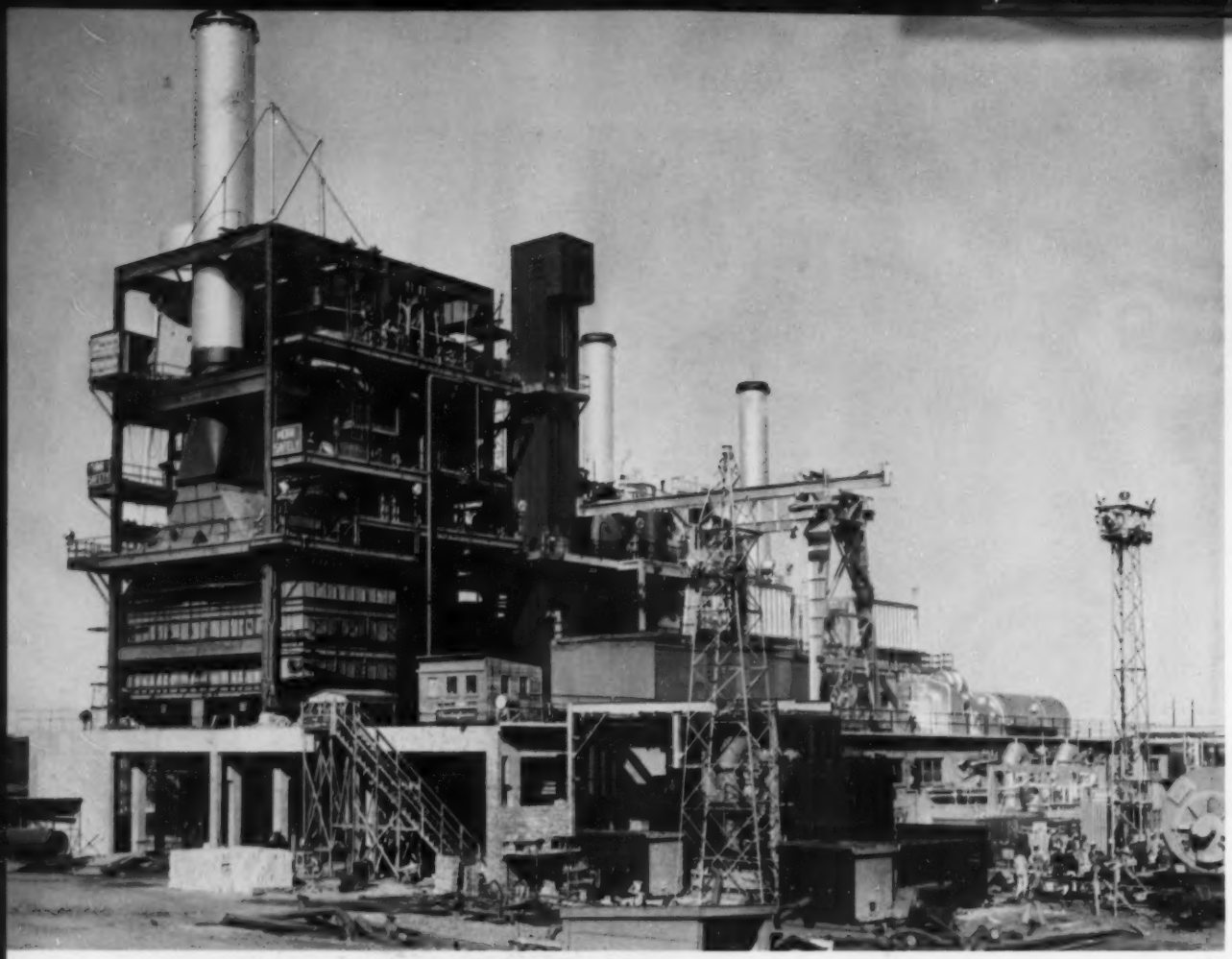
YOU CAN BE SURE...IF IT'S Westinghouse



Above, W. G. Steidley and M. C. Wigginton of Public Service take a reading of the K-24 instruments on the Westinghouse control panel. The latest in optical improvement makes these instruments readable from as far back as 20 feet or at angles as great as 65 degrees. The glare-proof dial is never obscured by shadows.

Below, an over-all view of the centralized control room at Southwestern Station. Control, indicating, recording, regulating and protective equipment is mounted on factory assembled and tested Westinghouse duplex switchboards. The latest in modern designs are utilized for simplicity of operation and attractiveness.





Unit No. 2—"on the line" March 15, 1954

Unit No. 2 at Southwestern Station, shown above under construction, went into operation March 15. It utilized the same basic techniques proved so successful with Unit No. 1.

The only variation was that Unit No. 2 employed a single large boiler instead of the two used for Unit No. 1. Cost was relatively the same.

With the addition of Unit No. 2, Southwestern Station became a very substantial element in the planning of Public Service of Oklahoma to meet rapidly growing loads which are characteristic of the area.

The experience gained at Southwestern has proved conclusively the many advantages to be realized through maximum coordination of both equipment and man power.

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- ☐ Isolated phase bus.....B-3906
- ☐ Power circuit breakers.....B-3904, B-3834
- ☐ Switchboards.....DB-32-300
- ☐ Instruments.....B-4696

CP-1016

Sawyer Duffy

Setterstrom Pollard

Karrer McIver

Engineers Told to Watch Economics

Engineers should look to change to effect greater economy and better service, L. E. Karrer, executive vice-president, Puget Sound Power & Light Co., told the group of 305 engineers attending the Engineering and Operating Section meeting of the Northwest Electric Light & Power Assn., held in Seattle April 15-17. Keeping a new look is a challenge to the engineer, he said. Management expects the engineer to use new methods, new materials and show a willingness to accept change to effect greater economy. Speaking specifically of distribution, Karrer said the distribution system can be a glutton for man-hours, can literally eat itself out of existence. Mechanize wherever possible and watch your man-hours, he said.

In substituting for A. W. Trimble, president of the association, Dick Setterstrom, Montana Power Co., had preached the same sermon as Karrer in the opening session. Changed ideas make for progress, he said, take in meetings with an open mind and go back and get dividends on what you learned. Meetings of this kind are a major factor in keeping costs down so that we can continue to give the public service at ever lowering cost, said Setterstrom.

A. I. Sawyer, Idaho Power Co., as chairman and M. D. Duffy, Pacific Power & Light Co., as vice-chairman of the E&O Section had arranged for and handled the meeting. Luther C. McIver, Puget Sound Power & Light Co., general chairman for the meeting, received high praise for the manner in which it was handled. Duffy, who becomes E&O chairman for next year, will be replaced by M. F. Hatch, Washington Water Power Co., as vice-chairman. Spokane is under consideration for next year's meeting. Registration was 305, second highest recorded.

Among important topics discussed at the meeting was that of high-voltage d-c testing of insulation of rotating equipment. G. L. Hill, Pacific Gas and Electric Co., was there through the courtesy of his company to describe the new method. Hill said the method gave an accurate indication of condition of the insulation with a very minimum of danger of damaging a good winding. Equipment is light in weight, portable and tests can be made quickly. PG and E has tested more than 3,000,000 kva of rotating equipment and uses the test as the sole criterion for rewinds, some of which run as much as $100,000. The dependable information on dielectric strength given by the d-c method has made possible cutting dry-out time on new windings from weeks ranging down to none at all, saving many thousands of dollars of machine time, Hill stated further.

Transmission and Distribution

E. W. Hampel, Chairman

The dollar sign was put on distribution economics in several discussions. Allen D. Fragall, Portland General Electric Co., contributed importantly by describing mechanical equipment used by his company to cut line construction costs. He called on his Oregon City division superintendent, Perry Landsem, to describe a new electrically operated extension ladder that is expected to pay for itself several times over this summer on transformer changing alone. Another of his superintendents, W. T. Arthur of the Gresham division, described a $100 stringing tension reel that pays for itself about every job by accurately and dependably holding tension when stringing where hot circuits are involved. Pneumatic tools for tree trimming, line work and tamping, industrial monkeys and front-mounted pole derricks were among other equipment covered by Fragall in the symposium.

Allen Paine, Portland General Electric Co., presented a strong case for a tapless 7.2-kv distribution transformer that could be obtained at a possible 5% saving in cost. "We have every reason to believe that tapless 7,200-v transformers soon will be the basic standard," he said. "It is difficult to reason otherwise, since the pattern has been set in the 2,400-v class. Due to the increase in residential load, it is unthinkable that 2,400-v lines would be further extended and therefore the same thinking regarding taps on distribution transformers now applies to the higher applicable voltage." C. L. Brown, Pacific Power & Light Co., observed that savings might pay for better regulation. A showing of hands indicated a decided consensus of member companies represented as favoring the no-tap 7,200-v transformer.

Another attack was leveled on costs, this time on transmission, by Currie N. Teed, Idaho Power Co. He gave his company's experience with aerial survey of transmission line routes, stating that the method had effected very large savings, particularly in

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Hatch Martin

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cost of right-of-way. The land owner has no preknowledge of the proposed line and is much easier to negotiate with, especially when he is told that he will be given the fascinating aerial picture of his farm.

Aluminum conductors and connectors came in for their share of discussion. Ed Casey, assistant chief engineer, Anaconda Wire & Cable Co., New York, said he expects millions of pounds of aluminum for all power and communication uses to increase from 750 in 1954, to 1,100 in 1959, as compared with 1,530 for copper in 1954, and 1,800 in 1959.

Entirely new concepts of the aluminum connector problem have come out of intensive research, said Richard Harap, Burndy Enginering Co. Inc., Norwalk, Conn. The compression principal is being recognized in the distribution field, he said. A large mass C-shaped connector that is slipped into the compression tool first facilitates installation and makes a fine connection. A new approach to the copper-to-aluminum connector problem has developed an understanding of galvanic and corrosive action and the problem appears near solution. Harap said that a broad range of connectors redesigned for aluminum is now available.

Chuck Klaus, Allen-Bradley Co., contributed a comprehensive discussion on the problem of protecting three-phase motors and customer equipment now available for preventing motor burn outs from single phasing of primaries. R. C. Martin, Pacific Power & Light Co., reported satisfactory operation on one installation of eight sectionalizers. J. C. Jones, Idaho Power Co., said that no trouble had been experienced on 14.4/25-kv rural lines using 15-kv-class transformers. Mountain States Power Co. reported some trouble in a rather special case in Casper, Wyo., and is changing back to 12 kv. Manufacturers' representatives opposed use of 15-kv-class equipment, recommending 18-kv class instead, but Jones said they preferred to take a calculated risk because of the much greater cost of 18-kv-class equipment.

Power Production

M. F. Hatch, Chairman

A. D. Martin, Washington Water Power Co., substituting for C. N. Phillips, Ebasco Services Inc., New York, went into the economics of transporting energy. Speaking of steam generation from coal, he said that long-distance electrical transmission in the Pacific Northwest cannot be justified unless generating plants are located near mine mouth and even then only if supplies of water and long-term, low-cost fuel, and high load factor can be assured.

A paper by E. L. Bayles summarized Northwest experience and outlined field tests from which a great deal has been learned about generator thrust bearings. He mentioned preheater starting tests that gave remarkable results.

Utilization Committee

William A. Heineck, Chairman

One of the most lively sessions from the standpoint of floor discussion was that of the utilization committee. On the agenda were oil pipe-line pumping, community TV, street lighting, range of voltage unbalance, air conditioning and use of higher secondary voltages.

The Uni-Ballast system is designed for better efficiency and lower street lighting costs, said W. L. Chapman, Line Material Co. He said the 10-kva regulator will now operate 30 EHI-400-w lamps in series, an increase of five lamps over previous capability. Fluorescent street lighting has met with favor in Sandpoint, Idaho, said Ken Sheen, Mountain States Power Co.

Community TV systems appear to be causing power companies no particular trouble. Pacific Power & Light does not meter amplifier installations, estimating wattage and treating them the same as street lighting. Coaxial cables are classed as communication in line construction.

Ideas varied widely on the matter of voltage unbalance, voltage standards and regulation. Customers' equipment, particularly TV, is requiring better voltage regulation and the utilities have a problem. Several advocated higher secondary voltages to serve the increasing loads, but it was pointed out that the 115-v standard for household appliances and the hazard of higher voltages in the home were deterring obstacles that it would be hard to overcome. Walter Heston, ELECTRICAL WEST, made two observations: (1) That if automatic voltage regulation is carried as far down to the customer as can be proved to be economically justified, voltage regulation problems would largely be solved, and (2) that in serving the larger residential loads of the future we might go first to 480/120/240-v dry-type metal-clad load centers on the customers' premises served by 480-v secondaries; and as the ultimate step a customer-owned small unit substation, as it were, with suitable dry- or Pyranol-type transformers, single or three phase, fed from direct-burial, high-voltage primary cables.

Purchasing Committee

Tom Miksch, Chairman

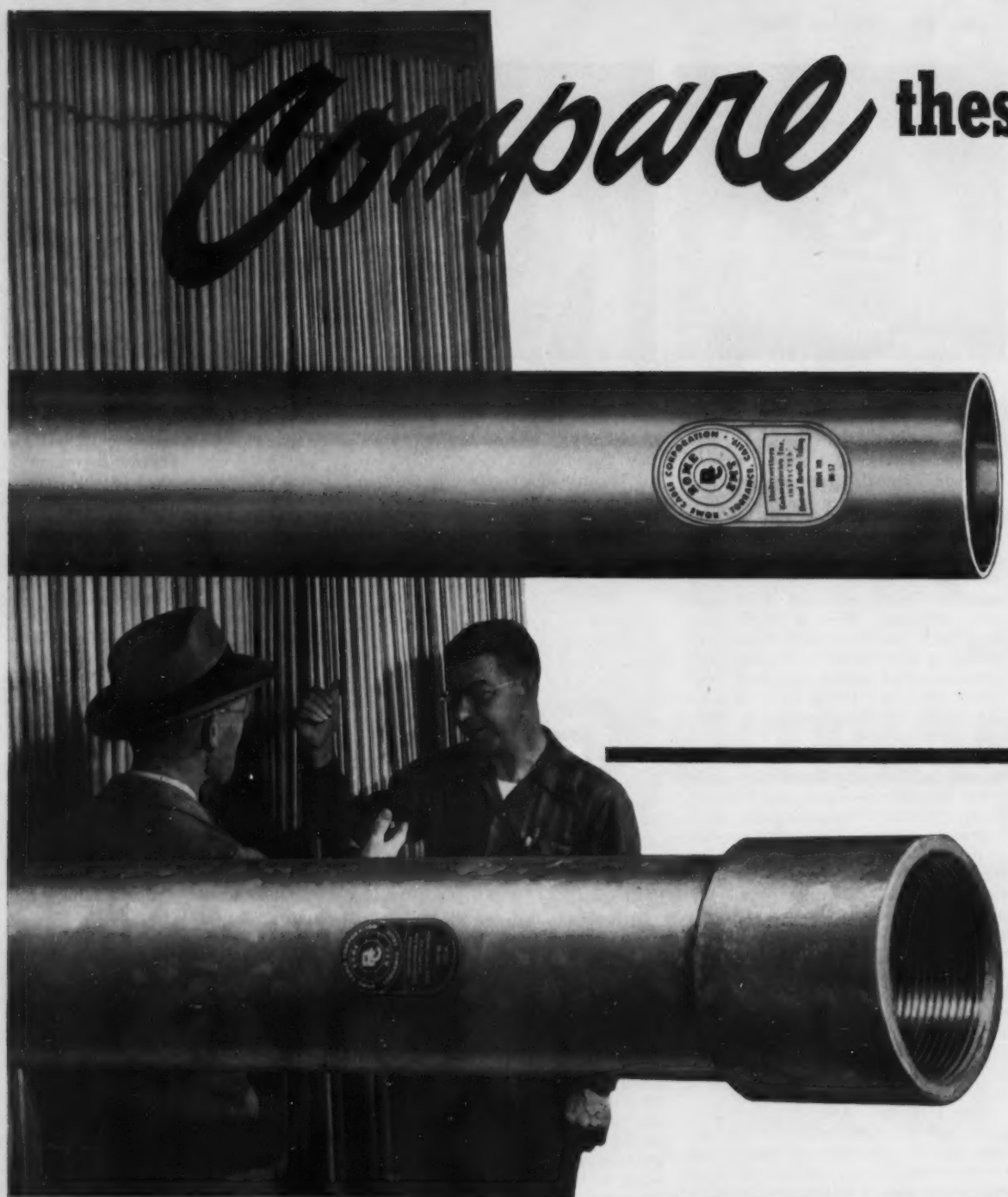
The purchasing committee made its contribution with a presentation on trends in the use of copper and aluminum by Ed Casey, Anaconda Wire & Cable Co. This has been commented upon previously.

Electrical Equipment

Dix Shevalier, Chairman

Autotransformers provide a means of keeping down system costs besides possessing other advantages, said

Compare these



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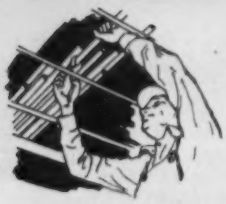

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Philip Light, General Electric Co., Schenectady. Glen Lane, Washington Water Power Co., covered relaying network transmission lines. Ray Rader, Puget Power, cautioned against using higher speed relays than necessary because troubles magnify with speed. He said pilot-wire relaying is sound but that its present drawback is frequent trouble with communication circuits. This is now being studied by AIEE-EEI committees.

Advantages and disadvantages of supervisory control were presented by Ralph Radford, Utah Power & Light. J. C. Jones, Idaho Power, reported very satisfactory experience with his company's extensive supervisory system. It is company practice to give line clearance of supervisory-operated breakers, but very strict grounding rules are observed before going on a line. H. W. Smith, B. C. Electric Co., reported savings of $331,000 a year on 11 supervisory-controlled stations as compared with manual operation.

Jess Scoville. Portland General Electric, recounted his company's experience and practice with inhibited transformer oils. He said inhibited oil has a life of 14 or more times that of noninhibited oils. Reclaimed oil with inhibitor added will not have as great a life, however, as original oil.

Commenting upon the remarks of Smith on spare equipment practice, O. D. Lanning, California-Pacific Utilities, suggested the pooling of spare equipment by members of the Northwest Power Pool as an economy and service continuity measure.

Earl V. DeBlieux, General Electric Co., Pittsfield, Mass., speaking on future design of high-voltage bushings, described features of the new type U Locke bushing. This is a one-piece porcelain bushing, smaller, lighter and more rugged, with good stress distribution. It will reduce stocking and maintenance, he said.

Electronics Committee

Ralph Deesen, Chairman

The many uses and advantages of closed-circuit television, including reading boiler gages and combustion control, were covered by Douglas J. Upton, RCA, Hollywood.

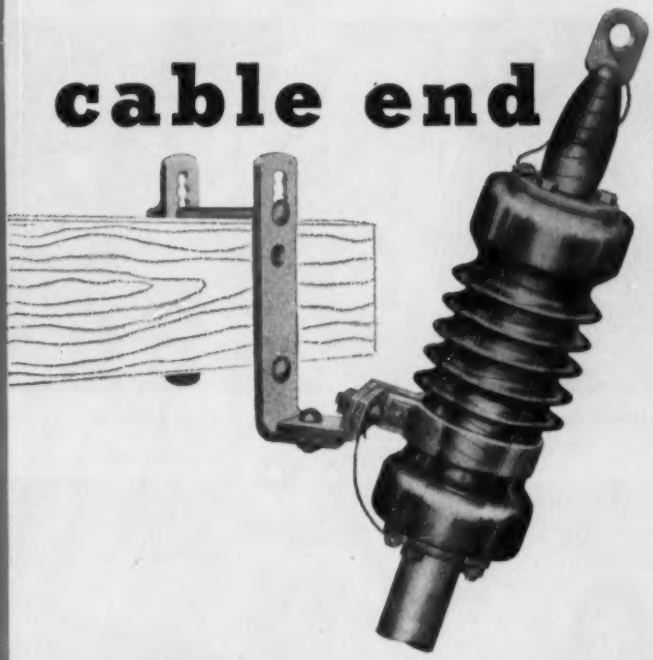
Television interference, handled by T. W. MacLean, Washington Water Power Co., stirred up a cross-fire of discussion. At the end, these conclusions stood out: TVI is not as serious a problem as was anticipated; the best policy is to require dealers to screen complaints first; education should begin with trade channels rather than the customer; it is up to the utility industry to set an industry-wide voltage standard and not TV manufacturers; 10% over-voltage will reduce tube life 50%; manufacturers say 5% above or below 117 v, or whatever the established standard, is permissible variation; crux of the problem is not high or low voltage but regulation from the established standard; set manufacturers cannot be expected to use built-in voltage regulators to correct the shortcomings of utility voltage regulation.

Bert Noon, Puget Power, reporting recent meetings with the FCC, sounded a note of warning and said the utility industry must vigorously defend its position or it will lose some of the radio, carrier and microwave channels now assigned to it. Density of microwave is already a problem, he said, and a microwave council is now being set up to work with FCC. This would be financed by a fee of $5 per base station per year to hire legal counsel to represent it in all matters.

William Dent, Westinghouse Electric Corp., San Francisco, substituting for L. A. Carter, Pacific Power & Light, discussed microwave and its applications. Highlights of his remarks were: There is bad crowding of the spectrum for carrier channels;

a new approach to

cable end seals



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A 542

Southern California Edison and Pacific Gas and Electric are now willing to release the sacred 6-mc channel demanded by relay engineers and make available six 1-mc relay channels instead; crowding of power-line carrier and restrictions of the FCC below 200 kc are directing attention toward microwave; manufacturers are working on equipment for 4-6 channel microwave service that will sell for about $6,000; microwave gives perfect talking circuits because of its excellent signal-to-noise ratio; plan microwave so it can be integrated with over-all system plans.

Meter Codes and Services

H. K. Dickinson, Chairman

Important trends in metering were noted by L. C. Blevins, Westinghouse, Newark, N. J., as: More standardization and simplification of meters; advances in reducing the number of meter ratings; standardization of A and S meter mountings; increasing use of polyphase meters; demand meters with lower maintenance characteristics; definite downward trend in use of mechanical demand meter registers; a package metering unit using very small size CTs and meter socket mounted in small-size compact box. Newest thing on the metering horizon is the extended range 15- and 50-amp S-type meters. The 50-amp size, latest of these, is a self-contained meter that meters loads up to 200 amp.

A. D. Morris, Portland General Electric, said large savings can be effected in metering large loads in the 200-amp range by using the new extended range meters. He noted savings of $31 to $65 per customer using the single-phase, three-wire, 50-amp socket meter and savings up to $91 using high-current socket meters for polyphase loads.

C. S. Alger, Puget Power, said there is scattered activity in adopting regulations governing the erection of TV antennas and the door is open for the utility to assist.

House Heating

L. M. Stinson, Chairman

A progress report on the operation of two air-to-air heat General Electric pumps in Portland was given by Wallace Gordon, Portland General Electric Co. He said some trouble had been experienced on one of the units with icing but that, everything considered, trouble had been minor. Coefficient of performance is between 2 and 2½. One is a 3-hp unit and the other 5 hp. The latter is operating at a little more than the cost of oil. Fairly high noise level on these units, he said, was a problem not entirely solved. After a full year's operation, complete data will be made available.

L. M. Stinson, California Oregon Power Co., reported on house heating tests on his system. Study brought out one revealing fact and this was that revenue per kilowatt of demand for a space heating customer was $1.70/kw as compared with $1.63/kw for the otherwise all-electric customer. He concluded that heating load may have some good points if you look for them, to say that it is good or bad cannot be determined by one company, and that some believe that space heating is not such a bad load after all. Present saturation on the Copco system is 15% and Stinson said it might have a saturation of 25% by 1957. Heating customers have a load factor of 17.73% as compared with 12.87% for nonheating customers.

Electric Club of Oregon's officers as they took office. James Kirwan is the president

William Cotter turned gavel over to Paul Benge who succeeded him as president of Sacramento Valley Chapter, NECA. Annual banquet chairman, Rex Moore Jr., seated below

Among Associations

John McManus, manager of the new Redwood Empire Chapter, NECA, at San Rafael, Calif., is congratulated on its formation by Ed Buttner, NECA vice-president for District 6, president of Scott-Buttner Electric Co., Oakland. This new chapter takes in Marin, Sonoma, Lake, Mendocino and Humbolt Counties, north of S.F. Bay

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THE MONTH IN BRIEF

Five Companies Form Firm

A regional generating company to finance and develop additional hydro power is being formed by five private power companies in the Pacific Northwest. Incorporation papers for the new firm, to be known as Pacific Northwest Power Co., were filed last month, with $50,000,000 of authorized capital stock. Initial plans would call for a $300,000,000 to $500,000,000 construction program. Kinsey M. Robinson, Washington Water Power Co. president, has been named president of the new firm. Serving with him as vice-presidents and directors are J. E. Corette, Montana Power president; Paul B. McKee, Pacific Power & Light president; T. W. Delzell, Portland General Electric board chairman; A. W. Trimble, Mountain States Power president.

Power Pool for Puget Sound Area

Formation of a power pool for the Puget Sound area is taking shape in the State of Washington. Members will be Tacoma City Light, Seattle City Light, Puget Sound Power & Light Co. and Chelan County PUD. The arrangement does not involve pooling of facilities or ownership, nor does it affect the individual utilities' membership in the Northwest Power Pool, it was emphasized.

Governors Pushing Projects

Development of electric power supply to meet load growth expected to require 6,402,000 kw of new dependable capability by 1963-64 was called for by the Pacific Northwest Governors' Power Policy Committee. The new organization, striving to get partnership programs off the ground and avert regional power deficits forecast for the future, adopted the reports of its engineering subcommittee at Victoria, B. C., last month and asked it to prepare a new list of the most feasible and least controversial hydro projects that could be pushed by private and public groups cooperating with the governors. The new list is due June 23, when the committee meets in Spokane.

PG and E Offers Partnership

Pacific Gas and Electric Co. has offered to construct all power generating and related facilities for the federal government's projected multipurpose development in the Trinity River. The offer, made at a Congressional Committee hearing on the project at Redding, Calif., would save the government an estimated $40,000,000 in capital outlay and would bring added revenue from taxes and company payments for use of the falling water. The $190,000,000 development contemplates water storage and conveyance works as well as four power plants and transmission lines to Keswick switchyard. PG and E ownership of the public works would increase its federal taxes by nearly $1,000,000 annually and its taxes to local agencies by about $900,000 a year.

Legislature Votes Funds

Before it adjourned last month, California's legislature voted funds to continue studies of state construction of the Feather River project and state purchase of the Central Valley development. An allocation of $276,698 will continue work on the CVP purchase plan. State Engineer A. D. Edmonston will complete his report on feasibility of the $1.2 billion Feather River project under an allocation of $677,056, which brings the total for these studies to $2,227,056. Ultimate water needs of the counties where the water originates will be studied under a grant of $376,895. The assembly committee on conservation, planning and public works, which has been investigating these projects and other water matters, was given an additioinal $20,000 to continue its work between now and January 1955, when the legislature reconvenes.

Washington State Too

Washington State may begin action to acquire federal dams within its borders, Gov. Arthur B. Langlie said recently. Stating that the drive to acquire federal dams could well be launched when repayment schedules are completed, he commented that power revenues from Grand Coulee and Chief Joseph could "do a lot of things for the state."

Arizona May Buy Lines

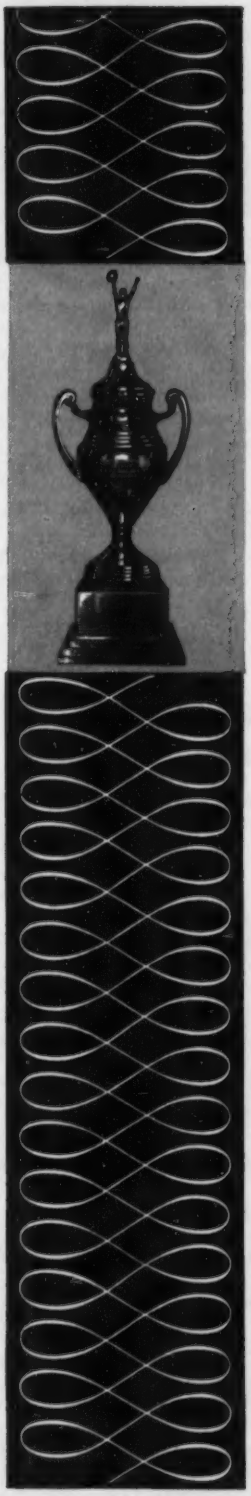
Legislation permitting the government to sell its power transmission lines in Arizona to the State Power Authority has been introduced in Congress. Sale price, according to Rep. John H. Rhodes (R) of Arizona, would be about $32,000,000 and payment would be over a 50-year period, with interest rate pegged to the yield of long-term government securities. Interior originally wanted about 60% down, it is reported, but budget bureau permission for a one-third down payment was secured.

Purchase Adds Customers

San Diego Gas & Electric Co. gained 2,000 customers with purchase of electric distribution lines of the Escondido Mutual Water Co. The agreement, effective April 30, excludes the water company's hydro plants and transmission lines but San Diego G & E will buy the entire output of the plants. Purchase price was just under $1,000,000.

Sales Tax Boost Proposed

A one-half per cent increase in California's sales tax to help finance water projects essential to the economic development of the state was proposed by Assemblyman Francis C. Lindsay (R), chairman of the lower house conservation, planning and public works committee.



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Commercial Electric Cooking Activity
The Ohio Edison Co., Akron, Ohio

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Electric Range Activity
Kentucky & West Virginia Power Co., Inc., Ashland, Kentucky

Electric Water Heater Activity
Florida Power Corp., St. Petersburg, Florida

Commercial Electric Cooking Activity
Atlantic City Electric Co., Atlantic City, New Jersey

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Chemical Business Handbook, just published, is the title of a valuable new book edited by John H. Perry. It is a reference book of modern business management keyed especially to the needs of the chemical and chemical engineering industries.

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THIS MONTH'S NEWS

Interior Turns Down Dump Power Request

Request of the Washington State Power Commission for all dump power available to Bonneville Power Administration from federal Columbia River projects has been rejected by Interior, according to Under-Secretary Ralph Tudor.

Tudor said, however, that he has authorized Bonneville Administrator William A. Pearl to explore with commission officials the suggestion that a state-wide body such as WSPC purchase and resell part or all of the federal energy that may be disposed of within the State of Washington.

The commission earlier announced that it holds public agency preference status and declared its intention of building steam plants to firm up the region's seasonal interruptible power.

Commenting on the request for all secondary interruptible and dump energy, Tudor said that as he understood it the suggestion would in effect amount to an option to be exercised by the commission as it might bring in steam plants or find other uses for the energy. He said the department was not sympathetic to giving such options and believes it to be better to restrict itself to ordinary energy sales contracts that are for specific purposes; that it would be inequitable to give one state or one customer such an exclusive option.

On the suggestion that the commission become BPA's prime customer in Washington State, Tudor said he wasn't necessarily endorsing the idea but was leaving it open to exploration; that it would be simpler for BPA to deal with one customer than many; that the department would not be a party to it if other customers would object.

Interruptible Energy Discussed in Portland

Industrial customers of Bonneville Power Administration took up the question of continued availability of interruptible hydroelectric energy with BPA officials in Portland April 1 in what was described as a regular conference called by BPA. Discussion included a report that the Washington State Power Commission may build steam plants to augment power supplies and a hint that WSPC may seek to obtain Columbia system federal power for resale to Washington utilities. (See above.)

William Krey, Northwest manager for Kaiser Aluminum & Chemical Co., said the future of power supply was the principal issue. "Our plants were built with Bonneville Power Administration understanding that the interruptible power supply would be fairly steady until such time as a firm supply was available," he added.

Krey reported: "It was agreed that our power committee, a five-man group, would explore the question of the future of the power supply which has the potentials of a serious problem."

Other customers represented among the 20 conferees were Aluminum Co. of America, Reynolds Metals, Pennsylvania Salt, Pacific Carbide and Anaconda Copper.

Tacoma Takes Financial Support from Committee

Tacoma's Public Utilities Board last month voted to withdraw financial support from the Pacific Northwest Utilities Conference Committee. It will remain as a member on a non-participating basis.

Made up of policy-making officials of public and private utilities, the committee's principal effort so far has been in calling attention of Congress to the need for hydro development in the area. Gerrit VanderEnde, Tacoma board chairman, said that the board "feels the time has come to quit going to Washington, D. C., to ask for something."

A few days before the Tacoma action, C. A. Erdahl, former acting Tacoma utilities director and founder of the committee, was elected its salaried chairman until June 30. Erdahl has served as chairman for four years without salary.

• **A campaign** to urge the federal government to build additions to Central Valley Project about equaling the money spent on existing units is being promoted by a group of water users from northern California and the Sacramento and San Joaquin Valleys. Known as Californians For Trinity - San Luis - Sacramento, the group has the backing of Senator Thomas H. Kuchel (R) of California.

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JOINT EFFORT NEEDED, SPEAKER DECLARES

Private and public power should get together to develop the hydroelectric resources of the Pacific Northwest but the federal government should provide one "new start" on a major project "to get the program going," Kinsey M. Robinson, president of the Washington Water Co. of Spokane, Wash., declared while in Seattle to speak to an investment bankers' group.

One agency might build a dam and another install the generating equipment, Robinson cited as an example of cooperation between private and public power.

A new start is required of the federal government, if a power shortage is to be averted after 1960, because the Eisenhower "partnership plan" requires separate legislation for each project, if federal aid is to be secured, and such a process requires time. Robinson does not expect the present Congress to pass any bills involving partnership proposals, such as those involving the Priest Rapids and Rocky Reach projects on the Columbia River.

Robinson proposed that Seattle and Tacoma City Light get together for joint new construction, and also the PUDs, "if they can get together." His own company expects to complete preliminary work in a few months on the proposed Noxon project on the Clarks Fork River in eastern Montana, to develop 350,000 kw at a cost of $90,000,000, with completion possible in two or three years.

PUD Halts Work on Box Canyon Dam

Terminating a $6,000,000 general contract with Pacific - General - Shea Co., Pend Oreille PUD halted work on the 50,000-kw Box Canyon Dam project near Ione, Wash.

Specifications called for completion of the dam in 289 days but the contractor asked last February for an extension to 353 days. The PUD refused, pointing out that work should be finished before June high water. Contractors accused the district of failing to carry out its contract obligations and charged it was unreasonable in its completion demands.

The district last month was negotiating with other contractors to complete the project.

• **Capacity** of B. C. Power Commission's diesel generating station at Quesnel, B. C., will be increased from 3,200 to 4,200 kw this year with installation of a new 1,000-kw unit.

COMMISSION BLAMED FOR DAMAGE, RESIGNS

The three-man British Columbia Power Commission and its chief engineer resigned recently after being blamed for failing to prevent two major slides which nearly buried the $6,000,000 Whatshan project.

Commission members resigning were Chairman S. R. Weston, W. W. Foster and Forrest L. Shaw. Alfred W. Lash was chief engineer. The new commission, promptly appointed, includes Thomas H. Crosby, former Pacific regional manager of Canadian Westinghouse Co. Ltd., chairman; Dr. Hector J. MacLeod, former dean of applied sciences, University of British Columbia; James D. W. Blyth, comptroller in Toronto for Brazilian Traction Power & Light Co.

The slides, which occurred last August, were caused by water seeping out of the tunnel and saturating the soil. It was claimed that the former commission had had repeated warnings of the danger and had failed to take effective steps.

Following their resignation, demands were made for a review of British Columbia's proposed Buttle Dam project on Vancouver Island. Permission to build the $2,500,000 dam, opposed for nearly three years by conservationists, was given in February.

Two Expansion Projects Planned by B. C. Group

Announcement of two power expansion projects in British Columbia to cost a total of $860,000 has been made by the B. C. Power Commission in Victoria. The commission will build a $660,000 addition to its Jingle Pot substation at Nanaimo to meet increasing demand and anticipated development on Vancouver Island. The other project is a $200,000 distribution system to bring to the Burton-Arrow Park area on Arrow Lake its first central station power. A new substation at Arrow Park will be fed by a 60-kv line from the Whatshan power plant.

• **Stanford Research Institute** has started operation of a Pacific Northwest Division, with an office in Portland. Through that office, the institute expects to launch a research program on problems of long-range development of power and water resources of the Pacific Northwest, working with other groups and interests in the area, according to Dr. J. E. Hobson, SRI director. Patrick M. Dowling will head the Portland office.

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Cope Cable Trough being installed at the Etiwanda Steam Station—Southern California Edison Company.

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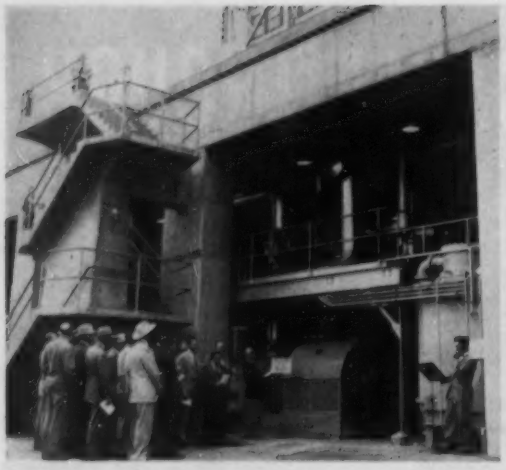

ETIWANDA PLANT DEDICATED — Southern California Edison's Etiwanda steam-electric station was dedicated at an open house in one of the company's observances of Light's Diamond Jubilee. Built at a cost of $41,200,000, the 265,000-kw plant was designed as an outdoor installation to reduce cost and speed construction. One of the plant's features is the outdoor operation deck on which the two 132,500-kw turbine-generators, boiler feed water heaters and other equipment are located. Representatives of state, county, city and various civic groups attended the dedication and inspection of the plant which followed

PUD Will Rent Lines From Private Company

Clark County, Wash., PUD commissioners have approved an agreement with Pacific Power & Light Co. for rental of part of the company's transmission lines in northern Clark County. The PUD will be able to take energy from PP&L's Yale Dam on the Lewis River, which is closer to the distribution area than Bonneville's connections.

Under the agreement, Bonneville Power Administration will bill the PUD for the energy, approximately 2,000 kw, and credit the amount to PP&L's account with the federal agency. The district will pay about $50 a month for use of PP&L lines. The deal is expected to save power line losses normally sustained by the company in transmission to Portland, and the PUD gains an additional delivery point.

Engineering Report Given On Priest Rapids Site

Some details of the engineering report on Priest Rapids site on the Columbia River, where a group of Washington PUDs seek to build a large hydroelectric dam, were made public last month by Cowlitz County, Wash., PUD manager, Glenn Hittle.

Hittle reported the engineering study shows that two low dams would cost $358,000,000 and would produce 7,740,000,000 kwh annually. A single large dam would cost $412,000,000 and have an output of 8,390,000,000 kwh.

Text of the report, Hittle declared, specified: "The studies . . . indicate the development of hydroelectric power at Priest Rapids is technically and economically feasible, either with a two-site or single-site development. The construction of either of the developments represents a sound venture."

Hittle said he had telephoned Rep. Russell V. Mack, Washington Republican, to inquire about progress of legislation designed to transfer construction authorization from the Army Corps to the Washington state agencies. Hittle quoted Mack as saying the plan had "tough going" because many lawmakers feel a precedent would be established if the site is cut loose by the federal government.

• **Disney characters** have been used this year to tell Pacific Gas and Electric Co.'s safety story to kite flyers. Especially prepared by the Walt Disney staff, a new comic book, *Pinocchio Learns About Kites,* has been distributed to all PG and E offices in the company's annual program to protect children from kite accidents and to lessen service interruptions caused by kites getting into power lines. The colorful booklet shows Pinocchio learning to fly a kite safely and how to build one; brings in eight safety rules.

• **Construction** has been started on a 90-mile transmission line from Palisades Dam to Jackson, Wyo., according to Manager Elno Draney of the Lower Valley Power & Light Inc. Cost is estimated at $460,000.

Montana Power Building Longest Transmission Line

Montana Power Co. has begun building its longest and largest electric transmission line—a 233-mile 161-kv link between Anaconda and Billings. Construction contract has been awarded to R. N. Campsey Construction Co. of Denver and C. F. Lytle of Sioux City, who submitted a joint bid. The job is to be completed by Oct. 8.

At Clyde Park, a 21,000-kva substation will be built to serve a 12-mile 50-kv transmission tap to be built to Livingston as part of the project.

Additions will be made to the Livingston substation, the Rimrock substation in Billings, and the Anaconda-Grace substation, northern terminal of a 161-kv line from Utah, forerunner of the Northwest Power Pool.

The new line will span two mountain ranges, the Continental Divide through Pipestone Pass, near Butte, and the Bridger Range through Flathead Pass, 15 miles north of Bozeman.

• **Eminent domain** proceedings to acquire property for a steam power plant at Hyperion have been filed with the Superior Court by the Los Angeles Board of Water & Power Commissioners. Site is between the Standard Oil Co.'s El Segundo refinery and the Los Angeles Hyperion sewage plant. It is about one-half mile north of a steam plant under construction by Southern California Edison Co. The property covers 90 acres of land, largely unimproved.

The Kerite insulated cable and wire exhibited at the International Centennial Exposition of 1876, received a certificate of award from the United States Centennial Commission, dated September 27, 1876. It is interesting to note that the telephone and multiple telegraph of Dr. Alexander Graham Bell were also exhibited at this exposition.

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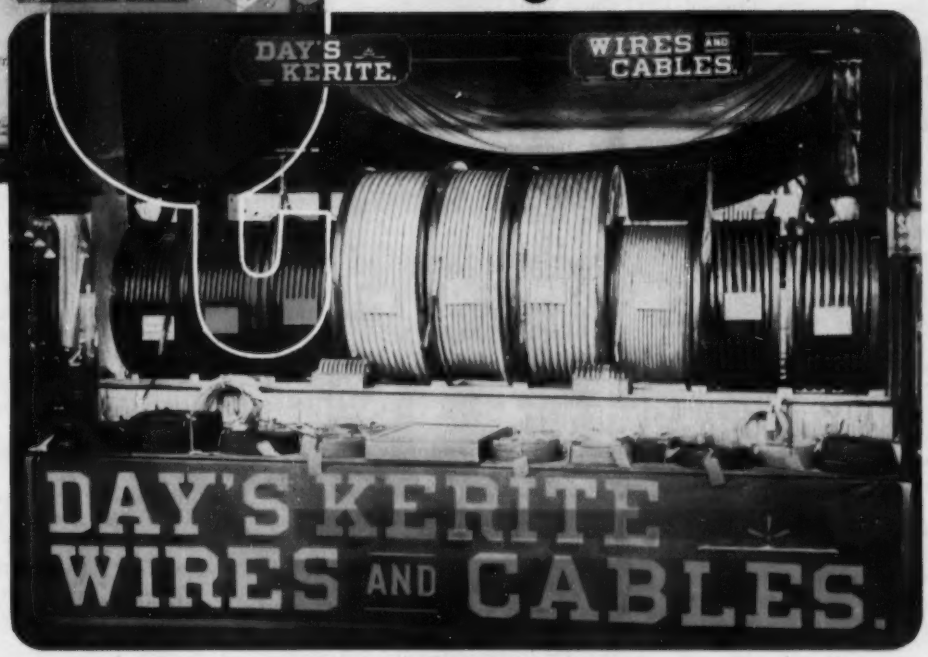

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THREE-DIMENSION PORTRAYAL—More than 300 stockholders of Arizona Public Service Co. donned 3-D glasses for an armchair tour of the company's service area, in what is believed to be a first for this type of presentation for an annual report. President Harry B. Sargent narrated the colored slides that illustrated his report of 1953 operations and plans for the future. A company photographer spent about a month shooting pictures of various operations, including 3-D charts (left above), which were constructed by company staff. About 100 photos were used. At right, officers form a human organization chart

Merger Is Approved By Regulatory Bodies

With a merger agreement (EWEST February, p 140) approved by state and federal authorities, Pacific Gas and Electric Co. acquired controlling interest in Pacific Public Service Co., holding company for Coast Counties Gas & Electric and two smaller subsidiaries. The transaction yields PG and E 84% of Pacific Public Service common stock and 60% of the total outstanding voting stock.

The merger will bring some 108,500 new customers into the PG and E system, which already serves well over two and a half million Californians. Although the company cannot say exactly what the merger will cost, it will charge $25,849,000 on its books if it acquires all the common stock.

James B. Black, PG and E president, has been elected chairman of the board of Pacific Public Service, and four other PG and E directors joined the PPS board.

PGE Holders Approve Common Stock Split

A two-for-one split of Portland General Electric Co.'s 1,500,000 shares of common stock won approval of stockholders at the annual meeting April 14.

Stockholders also voted to boost the number of authorized shares from 2,500,000 to 5,000,000 and lower the par value per share from $15 to $7.50.

The stock split was urged by PGE Board Chairman Thomas W. Delzell, who claimed it would broaden interest in the company's stock and facilitate raising of equity capital in the future. He said no public financing was contemplated for the current year because the utility's needs will be met by an $8,000,000 bond issue sold last November plus short-term bank credits.

• **Application** of Klickitat County, Wash., PUD for a $345,000 loan from Rural Electrification Administration has been approved. The funds are to finance 75 miles of new lines to serve 368 new users and for system improvements to meet increased loads.

• **Largest single property tax** in California history was paid by Pacific Gas and Electric Co. last month. Representing slightly more than one-third of the company's total tax bill, payments to 48 counties, 182 cities, more than 1,500 school districts and others amounted to $35,586,395, up $3,812,300 from last year. Total tax bill of the company was $97,466,492.

• **Franklin County PUD** of Pasco, Wash., has sold a $400,000 bond issue to Foster & Marshall of Seattle at an effective interest rate of 3.03491%, according to Manager Harry Hudlow. Five other bids ranged up to 3.231%. The bond issue will finance a new warehouse, construction of feeder lines and purchase of equipment.

• **New Mexico** Public Service Commission has approved an $8,500,000 financing program proposed by El Paso Electric Co. which operates in southern New Mexico. El Paso Electric plans to retire nearly $5,000,000 in short-term bank loans, replenish its treasury for money already spent on improvements, and use the balance of the new money for 1954 improvements and extensions. It plans to sell 76,399 shares of common stock without par value at not less than $25.50 per share, issue $5,000,000 in first mortgage bonds accruing in 1984, and 15,000 shares of preferred stock without par value at not less than $100 plus accrued dividends. The common stock will be offered to present holders of common stock on a basis of one share for each 10 now held.

• **Central Lincoln County** PUD, Newport, Wash., will ask voters to approve a $950,000 bond issue at the May primary election. The money would be used for expansion during 1955 and 1956. According to a load growth survey made by the PUD and Bonneville personnel, the present load of nearly 30,000 kw is expected to hit 41,000 in 1955 and 50,000 in 1957.

• **Pacific Power & Light** Co.'s $8,000,000 issue of 30-year first mortgage bonds went to a group of five investment firms on their bid of 101.09 for 3⅜% coupon. The bid gave PP&L an effective interest cost of 3.317%. Buyers were Blyth & Co., White, Weld & Co., Drexel Co., Witter & Co., and Eastman, Dillon Co. Proceeds will be used to retire bank loans and other short term indebtedness and to finance 1954 construction activity.

• **Snohomish County PUD** of Everett, Wash., has awarded contracts totaling $653,982 for construction of an office, warehouse and garage headquarters building. The project involves two buildings.

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PP&L-MOUNTAIN STATES MERGER GETS APPROVAL

Merger of Pacific Power & Light and Mountain States Power companies has been approved by the Oregon Public Utilities Commission. Commissioner Charles H. Heltzel noted that economies resulting from the merger should provide rate adjustments and uniform schedules in various districts throughout the areas served and facilitate future financing at a lower cost than for the separate companies.

The agreement provides for exchange of two shares of preferred stock of Mountain States for one share of preferred of PP&L and one share of MSP common for nine-tenths of a share of PP&L common. It also provides that the present outstanding common stock of no par value of PP&L be converted into $6.50 par value per share. A further provision is made that PP&L shall assume all indebtedness and obligations of MSP upon merger.

PP&L, as the surviving concern, is authorized to issue 2,204,456 shares of the new $6.50 par value common in exchange for its 2,204,456 shares of no par value common outstanding on Feb. 28, 1954, on a share for share basis. Also authorized is issuance by PP&L of 36,496½ shares of additional 5% cumulative preferred stock, $100 par value, in exchange for the outstanding 5% cumulative preferred, $50 par value, of Mountain States. This would be done on basis of one share of PP&L for two shares of MSP preferred.

Pacific was given 10 days after consummation of the merger to file with the utilities commissioner in writing adoption of the rates, tariffs, rules and regulations of Mountain States. Heltzel noted employees of both companies will carry the same responsibility as now and gain additional retirement benefits.

The order noted PP&L, with headquarters in Portland, is a Maine corporation and operates in Oregon and Washington. Of its 1953 gross revenue, 65.09% was received in Oregon. Mountain States, a Delaware corporation with headquarters in Albany, Ore., operates in Oregon, Idaho, Montana and Wyoming. Of its 1953 gross revenue, 60.34% were received in Oregon.

• **Tacoma Public Utilities Board** has sold a $5,000,000 bond issue on a low bid of 2.508% to Bramhall & Stein of Seattle, representing the First Boston Corp. and 12 other financial firms. Seven firms submitted bids, with the second only $1,400 below the first.

INTERCONNECTIONS STUDIED BY TWO COMPANIES

Interconnecting transmission circuit proposals to tie together four divisions of Pacific Power & Light and Mountain States Power companies have been studied by engineers of the two utilities. Details were reported to the Oregon Public Utilities Commission during the hearing on the companies' application for merger, which has been approved.

PP&L President Paul B. McKee told PUC the proposed 115-kv transmission lines would result in substantial savings in system-wide operating expenses in Oregon and improved service in the Clatsop County division of Pacific and the Tillamook division of Mountain States. The two divisions serve coastal areas and the Tillamook area is separated from MSP's main division. Cost was estimated at $6,215,000, of which $4,056,000 would have to be spent by the individual companies even though no merger resulted. The additional investment of $2,160,000 would produce an estimate savings of $246,300 in 1955 and $484,000 in 1956, according to McKee's testimony.

The lines would include one from Pacific's Portland area to link with Mountain States lines that approach Salem at the northern edge of MSP's Willamette division; one from the Willamette division to MSP's Tillamook division on the coast. The third loop would tie Pacific's Clatsop County area to MSP's coastal Tillamook division.

The proposed lines would provide the merged companies with an opportunity to supply the coast properties with energy over either of two loops in emergency. As an alternate to the Willamette-Tillamook divisions interconnection, McKee told PUC it might construct a 115-kv line between Tillamook and Timber. This would link up with Bonneville Power Administration's Forest Grove-Timber service and get a new power supply into Tillamook in 1955, a full year ahead of BPA's present schedule. The federal agency plans to build a Tillamook-Timber line but PP&L has in the past taken over construction of transmission facilities scheduled by BPA.

Future plans also call for additional transmission line capacity linking Coos County, now served by MSP, with the Bonneville system.

• **Some 1,300 employees** of Puget Sound Power & Light Co. have received a 2% wage increase, retroactive to Jan. 1, under a new contract with Local 77, Electrical Workers' Union, AFL.

QUIET OPERATION

According to tests completed recently, this new switch not only meets but exceeds the rigid requirements set up by Underwriters Laboratories for AC switches. It may be used at *full rated capacity* on fluorescent loads at voltages from 120-277 v., on inductive loads (120-277 v.), on incandescent lamp loads, and on resistance loads for heaters, etc. In addition, it is highly practical for motor loads (120-277 v.) at 80% of current switch rating.

A feature of the new switch is the silver alloy contacts which prevent corrosion and hold temperature rise to an absolute minimum. Units may be used with any standard switch plate.

Withstands Inductive Loads at Full Rating
The economical answer for 277-volt instant-start slimline single-pin base fluorescent systems.

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Inrush factor at least 8 times full rating of switch.

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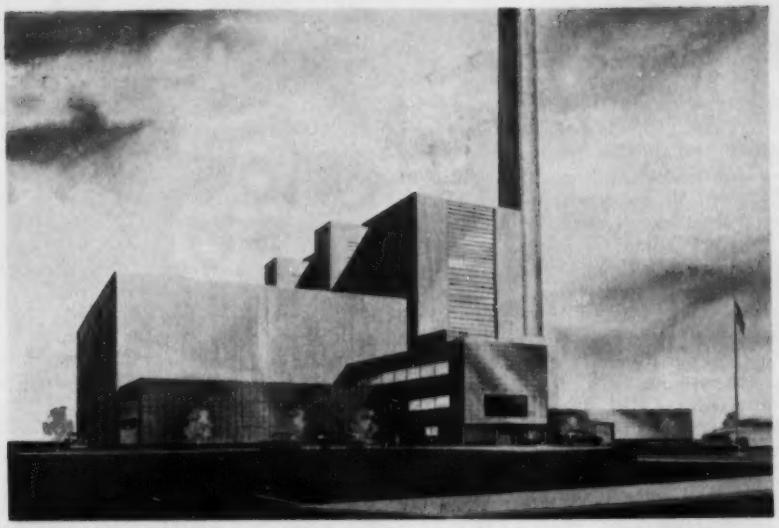

NEW PLANT—Morro Bay steam plant, $44,000,000 project being built for Pacific Gas and Electric Co. on the California coast, will be one of the most attractive plants architecturally in the system. It will feature fluted aluminum and porcelain enamel on the exteriors, fashioned in broad panels, which will be modernistic and in keeping with the plant's operational design. Facades of the machine shop, office building and warehouse will join the main building on the north and will be done in three blending tones of ferro-porcelain enamel. It is believed the plant will be the first in American utility history to use salt-water evaporators to provide fresh water needed for steam

Private Industry Told It Cannot Afford to Stay Out

Two spokesmen for the General Electric Co., prime contractor at the Hanford Atomic Products Operation, recently declared that private industry cannot afford to stay out of the atomic power producing business.

Thor W. Hauff, manager of the process section of the manufacturing department of Hanford, declared in Spokane that "the atomic energy field is so new, so big, so revolutionary and so full of commercial possibilities that companies cannot afford to stay out of the business.

"When one pound of uranium-235, completely fissioned, will yield energy equivalent to burning 1,500 tons of coal or 300,000 gal of gasoline, industry can't ignore its possibilities."

Hauff pointed out that the Hanford plant alone, now representing an investment of about $460,000,000, will "soon have an investment of $1 billion — a figure greater than the total initial cost investment of the entire G-E company with its 130 manufacturing plants and some 200,000 employees."

Roy Beaton, manager of the G-E design section at Hanford, told the Richland, Wash., chamber of commerce that private financing of the atomic industry "is not practical unless the industry can get into the power business with both feet."

He placed the investment in plant facilities per employee at about $76,500 at Hanford, "which is reasonably close to the $92,800 reported by Pacific Gas and Electric."

Beaton explained that "since no one can conceive of a stable market for atomic bombs, it is quite evident that private financing is not practical unless the industry can get into the power business."

Beaton said the production of power would provide the industry with a free market for a salable product and thus make possible the transition of the government-owned weapons business into a privately owned power business.

"It is entirely feasible, in time," he declared, "for the weapons industry to be furnished its materials as by-products of the power industry."

• **Electric Companies** Public Information Program has issued the first supplement to its Atomic Energy Information Kit prepared last year. Designed to bring utility management and personnel up to date on developments in the atomic energy field, particularly those related to nuclear power generation, the bound supplement also includes a summary of current electric industry activity in the field. Copies of the original kit, a looseleaf book of some 175 pages, are available at $8 each through Bozell & Jacobs, 2 W. 45th St., New York.

WATER CONSERVATIONISTS ROUSED BY MINING CLAIMS

Uranium strikes in Gila County and the resulting rush to file claims has aroused central Arizona water conservationists. Mining finds in the Young area threaten to stop Arizona's watershed research program at the Sierra Ancha Experimental Forest.

More than 200 mining claims have been filed, taking up nearly a third of the forest area's 13,000 acres. Among those protesting was the Salt River Valley Water Users Assn., whose watershed includes the Sierra Ancha region.

Drawing on Arizona's meager rainfall for both hydroelectric and irrigation purposes, the Water Users are concerned with getting a maximum runoff and storage.

The forest was withdrawn for scientific purposes in 1934 because it was possible to encompass in one small area nearly every watershed condition encountered in Arizona. The experimental forest provides within a 20-mile area topography from semidesert to alpine spruce and fir forests at an altitude of 9,000 ft.

The U. S. Forest Service is pressing to have the land withdrawn from prospecting in an effort to save 30 years' work. Researchers say that a network of access roads and mining excavations will destroy the area's scientific value.

Two-Year Research on Wood Poles Started

A two-year research program expected to save industrial users millions of dollars in pole costs by establishing more precisely the breaking strength of wood poles has been started by the American Society for Testing Materials at the U. S. Forest Products Laboratory, Madison, Wis. As now planned, tests will be made on about 600 full-size poles of different species and on some 15,000 small specimens taken from the poles to determine the quality of the clear wood.

The research is designed to replace existing inadequate and conflicting data on pole strength with a solid basis of technical information for revised specifications. Program objectives are: more accurate pole design standards; greater assurance of getting poles that are strong enough at reasonable cost; new information on the effect of preservatives on pole strength; better specifications that establish accurate relationships among different species; substantial savings to buyers and processors of poles.

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BUFFALO 3 N Y

CONTRACT AWARDS MADE IN WEST

Some recent contract awards for Western projects and the companies that won them:

Morrison-Knudsen, with a bid of $1,446,736, was low among six bidders for the general contract for construction of Portland General Electric Co.'s Timothy Meadows Dam on the upper Clackamas River. The earth and rock-fill dam will impound 60,000 acre-ft of water to firm up some 10,500 kw of additional capacity to three downstream plants—Oak Grove, Cazadoro and River Mill. Work is scheduled for completion by Oct. 1, 1955.

Two equipment contracts for Pilot Knob hydro plant on the American Canal 20 miles downstream from Imperial Dam have been awarded by the Imperial Irrigation District. Elliott Co. of Jeannette, Pa., won a $1,121,486 contract for installation of two generators and accessories — largest equipment contract ever let by the district. A $948,180 contract for hydraulic turbines and governors went to Baldwin - Lima - Hamilton Corp., Philadelphia. The $10,000,000 Pilot Knob plant will generate 33,000 kw.

Bufnel Co. won a $248,200 contract for structural steel work at the Valley steam plant of Los Angeles Department of Water & Power.

English Electric Export & Trading Co.'s $1,946,410 net bid was evaluated lowest received by the Corps of Engineers at Seattle for two a-c generators for Chief Joseph Dam. The American Elin Corp. earlier had been announced as apparent low bidder at $1,996,115 on the specified minimum efficiency rating of 97.9. The English firm's lower net bid was based on application of one-half of its escalator allowance of 7% and on an efficiency rating of 98.25. The corps allowed $2,975 for each 1/100 of 1% above minimum efficiency rating in their evaluation.

Italian SAE Co. was awarded construction contract for prefabricated steel towers to carry B. C. Electric's 345-kv line from Pemberton Meadows to link up with the recently completed Wahleah line near Rosedale. Built to BCE specifications, towers are being sent from Genoa knocked down and will be assembled in the field. Engineers from Italy are expected to supervise the assembly.

Hallet Construction Co. and **Continental** Co., Crosby, Minn., were awarded contract by Bonneville Power Administration for a 30-mile transmission line on a bid of $240,782. The line is part of the Detroit-Albany 230-kv line in Oregon.

Bay Construction Co. and **Dan L. Cooney** Inc., Seattle, received contract for the McNary-Wishram section of the McNary-Ross substation line on offer of $890,762.

Westinghouse Electric Corp. won a $320,000 contract for capacitor rack equipment for McNary Dam power house.

Bids were to be opened in May for furnishing and installing the last generator at Hoover Dam. The final unit will have a capacity of 104,500 kw; will be about the same physical size as the earlier 82,500-kw units.

Bids for construction of an $18,000,000 diversion dam on the Skagit River at Gorge were to be called in May by Seattle City Light.

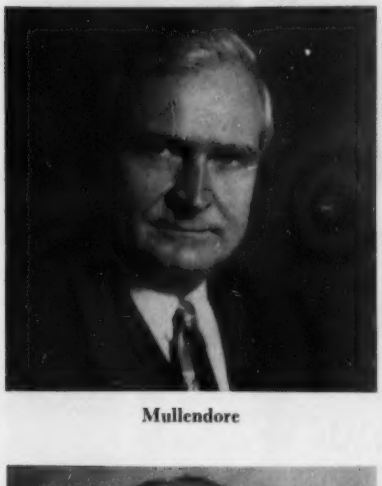
• **Paul J. Raver,** Seattle City Light superintendent, has requested the city council to appropriate $4,500,000 from the department's surplus in its construction fund to construct a 230-kv Duwamish receiving substation in the Seattle industrial district. The expansion is necessary to take care of the tremendous load growth in the south end, including the industrial area, Raver said. The substation will be needed in mid-1957 when Ross Dam's fourth 90,000-kw generator goes on the line. Included with the substation would be enough property to allow construction of a steam plant at some time in the future.

• **Central Lincoln** People's Utility District, Newport, Ore., has been granted a 10-year franchise renewal by Reedsport city council. The second and third reading of the ordinance in early March represented a compromise from a 20-year franchise proposal. Mayor Thomas Lillebo explained the city councilmen sought to leave the field open after 10 years in the event of organization of a municipal system. The franchise, effective at third reading, nullifies one to expire in 1957 and provides for a 2% of gross revenue levy within the city to be paid in municipal lighting and extension of street lighting.

• **Kittitas County PUD** of Ellensburg, Wash., is considering purchase of Puget Sound Power & Light Co. distribution lines in the county, according to H. A. Fleming, PUD manager. It was associated with other PUDs in an unsuccessful attempt to purchase the entire Puget Power system last year. Puget Power now serves some rural areas in Kittitas County.

• **Franklin County PUD** of Pasco, Wash., has approved sale of $400,000 in bonds to finance expansion and additions to the PUD's facilities.

NEWS ABOUT PEOPLE



Mullendore

Quinton

Edison Directors Elect Top Executives

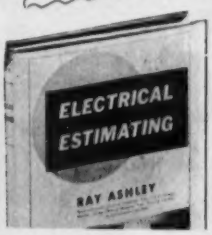
At their recent annual meeting, directors of Southern California Edison Co. elected **William C. Mullendore,** chairman of the board, **Harry J. Bauer,** vice-chairman, and **Harold Quinton,** president.

Mullendore, who has been president since 1945, last January completed 25 years as a general officer of the company.

Bauer, former president (1932-1945) and board chairman since 1945, joined the Edison law department in 1908; has been a director since 1926.

Quinton joined the company in 1942, as vice-president in charge of finance; was made a director in 1945 and executive vice-president in 1948. His service record includes participation in many industrial and civic activities.

ELECTRICAL CONTRACTORS AND ESTIMATORS



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By RAY ASHLEY

Research Engineer, Electrical Contractors' Assn., City of Chicago; Member, Chicago Electrical Estimators' Assn.; Electrical Engineering and Estimating Consultant

307 pages, 6 x 9, illustrated, $8.00

REFLECTING 25 years of experience in all branches of the electrical-contracting industry, this book gives information of value to the contractor, estimator, and engineer who must solve daily complex problems of estimating, appraisal, cost accounting, job scheduling, or supervision. Clear explanations, plus sample estimates and guides, show you how to handle lighting and power branch wiring—distribution equipment—auxiliary, summary, and final bid sheets—overhead and markups—checking estimates—and estimating special projects and residential wiring. Time studies and preparation of labor cost units, as well as studying plans and specifications are examined in detail.

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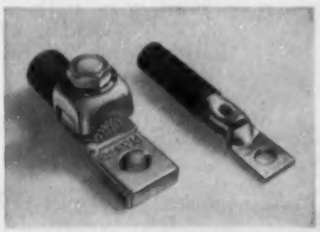

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HONORED—PG and E President James B. Black receives from Dr. Eric T. B. Gross, national president of Eta Kappa Nu, a certificate of eminent membership in the engineering society, as Dr. Jesse E. Hobson, its national vice-president, looks on. The presentation was in "recognition of technical attainments and contributions to society through outstanding leadership in the electrical engineering profession." Speaking to initiates of the UC chapter, Black said large companies offer plenty of opportunity to the young engineer, who need have no fear of being submerged in the organization; that there is no visible limit to technological progress. The award is one of four made this year

• **Appointment** of **J. Roy Jones** as Westinghouse Lamp Division regional engineer with headquarters at Los Angeles was announced recently. Since 1947 he has been a member of the Lamp Division's commercial engineering department at Bloomfield, N. J., headquarters. At Los Angeles he succeeds **Earl F. Larson,** who was transferred to the company's Electronic Tube Division there as regional sales engineering representative.

• **After 21 years** of service to the USBR, **L. R. Douglass** has retired as director of power for the Boulder Canyon project. He was succeeded by his former assistant, **Lloyd J. Hudlow.** Douglass was honored at a dinner at which he received Interior's highest award, the gold medal for meritorious service.

• **Brig. Gen. O. E. Walsh,** former Portland district and North Pacific division engineer for Corps of Engineers, has accepted a vice-presidency with Portland General Electric Co. He will take the post July 1 upon retirement from active service with corps, according to PGE President James H. Polhemus, who reported Walsh will deal primarily with power supply problems. Walsh was Portland district engineer for four years and in the higher division post for 2½ years. He left Portland to take command of the Mediterranean division in February 1952 and in December 1952 was assigned to the communications zone of the European command.

• **Richard E. Mittelstaedt,** president of the California Public Utilities Commission since 1948, retired on May 1, having reached the statutory age limit of 70. Before his appointment to the PUC in 1946 Mittelstaedt served the state as adjutant general and director of selective service. For 10 years he was superintendent of the water department for the City of Sacramento. A major in World War I, Mittelstaedt was inducted into the Army as a brigadier general in 1941 and served in the South Pacific and Alaska during World War II as assistant division commander of the 40th infantry division.

• **Harrel Kanzler,** electrical engineer, has been named superintendent of the electric department for the new Anaconda Aluminum Co. plant at Columbia Falls, Mont. Kanzler was an electrical engineer for General-Shea-Morrison in construction of Hungry Horse Dam and in 1952 became an electrical construction engineer for Aluminum Co. of America at its Rockdale, Tex., plant. He returned to Columbia Falls in August to become manager of the Casey Electric Co. contracting office in Columbia Falls. He received his BS degree in electrical engineering from Oregon State and a masters degree in 1947 after returning from Marine Corps duty.

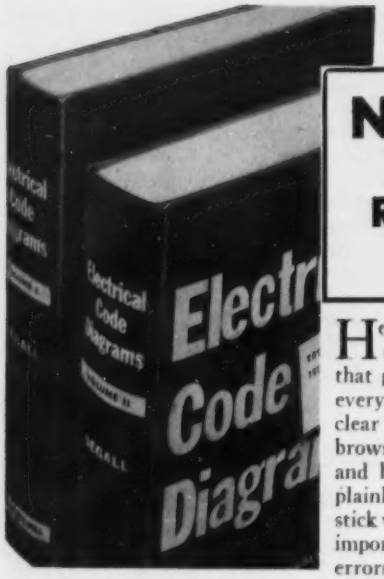
• **The California Legislature** has adopted a resolution commending the Los Angeles Board of Water & Power Commissioners and the Water & Power Retired Employees Assn. for planning a memorial to honor **H. A. Van Norman, E. F. Scattergood** and **W. B. Mathews,** who with **William Mulholland** provided the engineering, administrative and legal leadership necessary to provide Los Angeles with the water and power to make possible its phenomenal growth and industrial development. A memorial already has been built in recognition of the public service rendered by Mulholland.

Deaths

• **Harry L. Harper,** who retired in May 1951 as Pacific Coast district manager of Graybar Electric Co., died in Beverly Hills, March 12. He had started with Western Electric in 1903, later was manager at Kansas City, came to Los Angeles as district manager in 1919, became a director in 1941 and a voting trustee in 1947. He is credited with starting the Los Angeles Electric Club in 1921, was its first president. He initiated the adequate wiring program in the California Electric Cooperative Campaign in 1919 to 22; was a PCEA director; NAED Pacific Zone chairman and was president of Los Angeles Chamber of Commerce in 1934.

• **Francis E. Boyd** had long planned a trip to Hawaii but he never quite made it. The president of Pacific Electric Motor Co., Oakland, died of heart attack, aged 65, aboard the *Lurline* en route to Honolulu, April 21. Born in Pennsylvania, trained at General Electric test, he came to San Francisco in 1908 and for 23 years was with that company, finally as industrial sales manager. In 1928 he and the late Walter Vance bought Pacific Electric Motor Co. of which he was vice-president, then president. In 1949-1950 he was director and president of East Bay Municipal Utility District. Years ago he was president of contractors and motor shop associations.

• **Lloyd Flatland,** who had just recently closed the pioneer Globe Electric Works founded by his father, Martin Flatland, in San Francisco, because of ill health, died of a stroke April 15, aged 57. An indefatigable worker for the San Francisco Electrical Contractors Assn. he had served as its president and in NRA days was regional code administrator for the western states and NECA regional executive committeeman.



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NOTES ON THE TRADE

Westinghouse Annual Meeting Held in West

Westinghouse sales for the first two months of 1954 were 11% above the corresponding period last year and earnings also were substantially higher, President Gwilym A. Price told stockholders who came to Sunnyvale, Calif., last month for their first meeting in the West. This performance is a step toward its goal of even greater billings during 1954 than were achieved in record 1953, he said.

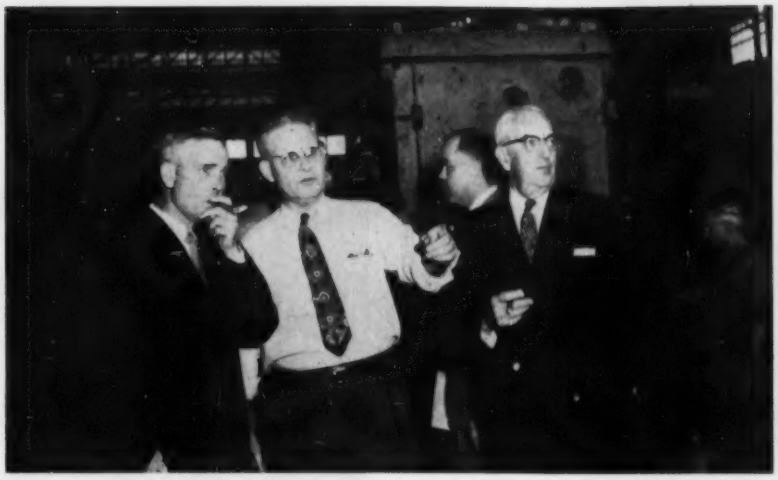
More than 1,200, a record attendance, gathered in the specially pitched "big top" (see cover picture) for this 68th annual meeting, fifth held outside East Pittsburgh. They came from 15 states and more than 100 cities; owned anywhere from one to 5,000 shares.

A feature was the announcement that Westinghouse had signed an agreement to buy television station KPIX in San Francisco. The proposed purchase is part of the company plan to acquire and operate TV stations in key centers, Price said. Completion of the purchase will depend on federal approval and tax legislation affecting this type of transaction now under consideration in Congress, he said.

Noting the current decline in business activity, Price said that a moderate decrease from the peak level was not unexpected. But he doubted the country is heading for a depression; preferred to view the current situation as a "transition in the upward march of our economy; a temporary decline while we prepare for the next ascent to a higher level of economic activity."

Audience participation in the meeting was excellent, the question period stretching overtime. Featured among the audience were two Ohio couples who won expense-paid trips to San Francisco in a company-sponsored essay contest for employee stockholders on "What Owning Stock in Our Company Means to Me."

• **Henry L. Badger** has been appointed assistant to the general manager, in charge of internal operations, by Guy de Leuze, president of Panama Lamp & Commercial Co. Inc., San Francisco. A graduate of Western Reserve University, Badger has had extensive business administration and accounting experience in many places.



TOURING the Westinghouse Sunnyvale plant following the company's 68th annual stockholders meeting there, President Gwilym A. Price (left) heard about work under way from H. C. Buckingham (center), assistant superintendent of mechanical manufacturing. Accompanying them is Joseph R. McGilvray, who headed Sunnyvale operations from the time Westinghouse acquired the plant in 1947 until his recent retirement

• **A nation-wide survey** being conducted by the Henry J. Kaiser Co. will determine where and when to expand its aluminum fabrication production. Edgar F. Kaiser, president, hinted that Kaiser may enter the aluminum container field. Kaiser, visiting the $110,000,000 expansion project Kaiser Engineers is building for the Atomic Energy Commission at Richland, Wash., said his company is studying power supplies, natural resources and potential markets. Kaiser said one part of the survey is on motor block production and that if the company enters this field "it might mean the doubling of the aluminum pig industry."

• **Walter E. Wallace** Co. of San Francisco has been appointed to represent Hope Electrical Products Co. of New Jersey, maker of electrical specialties. The Wallace company is located at 445 Bryant St., in San Francisco.

WESTERNERS were among those who took part in Sangamo's recent three-day general sales conference at Springfield on its new J2 watt-hour meter. Watching production are from left: J. E. Redmond, Phoenix; James H. Patton, sales manager; H. W. Wittenburg, Los Angeles; E. C. Whittaker, North Carolina; C. B. Falls, St. Louis

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Index to Advertisers
May 1954

Allen-Bradley Company 35, 36
Allis-Chalmers Mfg. Co. 13, 21, 38, 39, 59, 150
Aluminum Company of America 60, 61
American Tel & Tel 25
Anaconda Wire & Cable Co. 41

Briegel Method Tool Company 11
BullDog Electric Products Co. 43
Burndy Engineering Company 27

Chance Company, A.B. 47, 49
Cole Electric Company 160
Columbia-Geneva Division U.S. Steel 19
Cope Inc., T.J. 143

Dossert Mfg. Corp. 157

Federal Tele & Radio Corp. 9

G&W Electric Specialty Co. 135
Gardner Electric Mfg. Co. 8
General Electric Co.:
Bridgeport, Construction Materials Div. 34
Schenectady, Apparatus Division 14, 15, 62
Greenlee Tool Company 42

Hann, George E 153
Hotpoint Company, Div. G.E. 139
Hubbell, Inc., Harvey 148, 149

Indiana Steel & Wire Co. 153

Jeffries Transformer Div. Leach Corp. 28

Kaiser Engineers 140
Kearney Corp., James R. 52, 53
Kerite Company, The 145
Killark Electric Mfg. Company 130
Klein & Sons, Mathias 48

Lapp Insulator Co., Inc. 56, 57
Line Material Company 3
Locke Dept. G.E. Co. 4, 5

McCabe Powers Auto Body Co. 29
McGraw-Hill Book Company 153, 156
Marcus Transformer Company 50
Markel Electric Products, Inc. 152
Miller Company 54
Maloney Electric Company 30, 31

National Tele Supply Company 147

Ohio Carbon Company 46
Okonite Company 26
Orangeburg Mfg. Co., Inc. 20

Pacific Coast Borax Company 32
Pacific Coast Electrical Association ..... 4th Cover
Pacific Gas and Electric Co. ..... 3rd Cover
Phelps-Dodge Copper Products Co. 44 45, 154
Porcelain Insulator Corp. 159
Porcelain Products, Inc. 142

Rockbestos Products Corp. 12
Roebling's Sons Company, John A 33
Rome Cable Corp. 132, 133

Sangamo Electric Company 17, 18
Shell Oil Company 141
Simplex Wire & Cable Co. 55
Smoot-Holman Company 1
Southern California Edison Company ..... 2nd Cover
Square D Company 137
Sunbeam Lighting Co. 24
Sylvania Electric Products, Inc. 6

United States Rubber Company 7
United States Steel Corp., Columbia-Geneva Div. 19
Union Insulating Co., Inc. 16

Victor Insulators, Inc. 51

Westinghouse Electric Corp. 22, 23, 113, 114, 115, 116, 117, 118, 119, 130, 121, 122, 123, 124, 125, 126, 127, 128

Youngstown Sheet & Tube Co. 10

PROFILES

Hosts to the hordes who came to the official opening of Southern California Edison's new Etiwanda Steam Plant April 14 were its station chief, F. N. Green, and H. L. Anderson, assistant station chief. It was theirs to know the reasons why. They were asked every conceivable question and then more. They are pictured at the right

Arizona Public Service Co. received the More Power to America Award for its work in advancing the electrification of industry in 1953. Made annually by G-E, the award is administered by EEI. Shown below at EEI's Chicago conference are Harry Restofski, chairman of EEI prize awards committee; Douglas B. McGregor, Arizona Public Service; Karl Runkle, G-E

Orchid leis accented the "Come to Hawaii in 1955" invitation given the Public Utilities Advertising Assn. at its recent two-day meeting in Portland. C. E. Nolan, Hawaiian Electric, presents a lei to PUAA President Walter G. Heren of Union Electric as John Dierdorff, Pacific Power & Light, regional chairman of PUAA, watches

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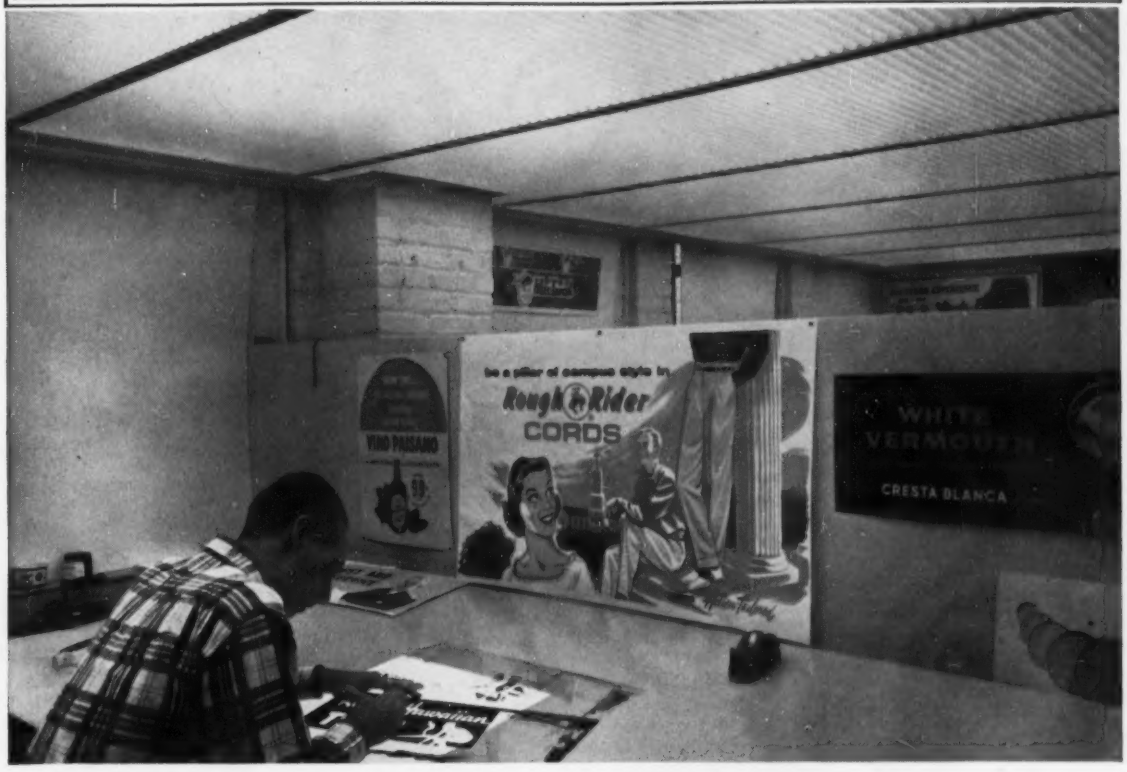

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The work of silk-screen artists for the Velvetone Company, San Francisco, takes a fine sense of color and a sure touch. But with the lighting the company used to have, shadows and glare often made it hard to do careful work, and caused lots of eyestrain. That's why Velvetone—though doubtful that its lighting could be improved—called in P. G. and E.'s lighting engineers.

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